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VOLUME 31 NUMBER 2 FEBRUARY, 1948

AMERICAN JOURNAL OF OPHTHALMOLOGY

THIRD SERIES FOUNDED BY EDWARD JACKSON

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Subscription price in United States ten dollars yearly. In Canada and foreign countries twelve dollars. Published monthly by the Ophthalmic Publishing Company. Subscription and Advertising Office: 700 North Michigan Avenue, Chicago 11, Illinois. Entered as second class matter at the post office at Menasha, Wisconsin.

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AMERICAN JOURNAL OF OPHTHALMOLOGY

VOLUME 31 FEBRUARY, 1948 NUMBER 2

OCULAR LESIONS FOLLOWING THE ATOMIC BOMBING OF HIROSHIMA AND NAGASAKI*

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INTRODUCTION

It seems necessary for me to relate briefly in chronological order the fortuitous series of events leading to my participation in the medical investigations at the atomic bomb areas in order to give the reader insight into the situation that confronted us and the difficulties we encountered in making a clinical study of the survivors. The atomic bomb had struck Hiroshima on August 6, 1945, and Nagasaki on August 9, 1945, three days later.

On September 7th, I was called to an interview held in Yokohama with Brig. Gen. T. F. Farrell, Col. A. W. Oughterson, Col. Stafford L. Warren and Dr. Masao Tsuzuki of Tokyo Imperial University. Dr. Tsuzuki had made an expedition to Hiroshima with some other Japanese several days before, but no American expeditions had been made until that time.

Farrell and Warren represented the Atomic Bomb Investigation Committee of the Manhattan Project. Oughterson, who was at that time deputy chief surgeon, General Headquarters, was to represent the Supreme Command. The Manhattan-Project group, of course, were interested in furthering technical studies carried over from the long train of laborious scientific experimentation and complicated industrial administrations that were partially consummated in the first test explosion of the atomic bomb conducted in New Mexico in July, 1945. Their survey was to comprise not only medical research but multitudes of technical observations in the realm of nuclear physics. Colonel Oughterson's task, more specialized, was to make a survey of the overall casualty picture and to organize and formulate a program for adequate study of the casualties. "They say this explosion gives off the light of ten-thousand suns!" he said to me. "If this be true there should be something for you to do."

Our party consisting of three medical officers and 16 others flew to Hiroshima on September 8th, and made the first official entry into the city of Hiroshima on the morning of September 9th. We visited the Red Cross Hospital in charge of Dr. Ken Takenchi and learned that at that time there were approximately 2,000 atomic bomb casualties in 80 hospitals in Hiroshima and surrounding area. Since most of these hospitals were very small and widely scattered over the countryside with no centralized registration, we could see an almost unsurmountable obstacle to organized study of cases. We learned that the death rate was 100 per day among those survivors and felt that any studies made would have to be instituted quickly.

Ujina Hospital was selected for the center of operations because it was located two kilometers from the center of the explosion and because it had the largest number of

* This work was performed as part of the medical researches undertaken by the Manhattan Project, under the guidance and supervision of Dr. Stafford L. Warren, then of the University of Rochester. The aid of Mrs. H. C. Wilder of the Army Institute of Pathology in interpreting the microscopic sections is also greatly appreciated.

patients and the most capable medical organization. Only 30 of the 300 doctors in Hiroshima were alive and able to work at that time. Fairly comprehensive blood studies had been made at Ujina by Dr. Nakao, but the rarity of English-speaking Japanese and our inability to use the records were very discouraging.

There were 220 patients in the hospital at that time for our study. Although all these patients were casualties of the atomic bombing in a sense, they included many types and categories that could furnish us only a small amount of useful information. Some of the patients were debilitated old people, some suffering only from malnutrition; others had thermal burns of the ordinary type sustained in the conflagration of their homes. Although it was our mission to gather statistics on the overall casualty picture including all types, our interest was unavoidably centered about the peculiar form of reaction to irradiation. Japanese records even when translated were often disappointing. Chaotic conditions were reflected in the confusing records kept of the patients. Great numbers of patients were moribund on admission. Lack of housing facilities, medical equipment and personnel, and time interfered with complete and adequate case studies. At one time there were 500 seriously ill patients cared for on the lawn in front of the Red Cross Hospital. This point was a center to which wounded were brought because special fire-fighting facilities had been set up there to keep the fire from that area.

Some of our patients were found in Ono Military Hospital, an old, made-over tuberculosis sanatorium, south of Hiroshima. Two weeks later a landslide brought on by a typhoon destroyed the entire hospital and killed nearly all the persons in it. We went through a small hospital situated in a school house containing several hundred casualties. The place was in charge of a lay nurse's assistant. She told us the doctor came every three days to attend the patients. Dozens of dead were lying among the living. Innumerable flies covered raw, granulating wounds.

At the end of the second day I had examined approximately 300 patients. I had found the usual traumatic lesions one sees in wartime but none of the corneal or lenticular syndromes I had expected to find. There were few ophthalmias among the sick and those found were of the nonspecific kind due to infection. Knowing the high degree of radioresistance of the tissues of the posterior segment I had paid little attention to ophthalmoscopic studies. Becoming interested in the blood studies and peculiar clinical picture of the late "aplastic" anemia, I felt that ophthalmology was to play a very small part in the pattern of radiation sickness or "atomic-bomb disease" as it was being called.

On the third day I was examining two moribund Japanese soldiers with bloody diarrhea, bleeding from the gums, covered from head to foot with petechiae. Their white counts were 2,000 and 900. I examined their eyegrounds. Both had extensive hemorrhagic and exudative lesions of the retina. It seemed entirely consistent with the rest of the picture. The observation seemed a minor confirmation of the findings of the clinicians and hematologists.

As I looked at these patients, I was struck by the remarkable similarity of the shape and form of the lesions in the two cases. Here were hundreds of cases of aplastic anemia! Why not make a study of them? There had never before been and perhaps never again would be such a collection of cases! Correlation of these ophthalmoscopic findings with those of the hematologists and clinicians made it evident that these characteristic fundus lesions were one of the most reliable criteria of radiation sickness. Thus we had acquired a very useful method of separating the radiation casualties from the others.

We had completed our initial survey and felt the need of equipment and personnel for a detailed and comprehensive study. We left Hiroshima on September 14th. Our expedi-

tion to Nagasaki began on September 20th when we flew to Omura. There we found the medical facilities much better than at Hiroshima. The geographic nature of the site of the explosion had resulted in far less destruction of life and property among the Japanese, leaving many able medical men to aid us in our work and to collaborate with us. There were also good buildings in which to work and a relative plenty of equipment and auxiliary personnel to help us. The large naval hospitals located in the vicinity provided excellent places in which to work. The Japanese did everything possible to aid us in carrying out our mission. It was here that a large part of the work herein described was done.

A number of English-speaking Japanese medical students from Kyushu Imperial University in Fukuoka were assigned to us as interpreters. Their work was of obviously great value in translating and interpreting the great number of case histories. At the bedside they were of greatest aid in questioning the patients and translating their answers. It was at Shinkozen Hospital in Nagasaki that my work began to assume organized form. I could see the outline of the task that lay before me. I compiled a check list of all the essential elements of my case histories and tabulated my cases in order not to forget any important data. A Japanese ophthalmologist by the name of Ikui, assistant professor of ophthalmology at Kyushu Imperial University, had been studying the cases there before I came. Through interpreters we had many discussions over the lesions. His studies were very thorough.

On the 26th of September our whole party moved its center of operations from the Shinkozen hospital in Nagasaki to the Omura Naval Hospital, 20 miles away, in which facilities for laboratory work and autopsies were excellent. In subsequent investigations extending over several months, the Omura Naval Hospital was the center, and all patients in surrounding areas were evacuated there for study and treatment. This large hospital was of excellent construction and well provided for in the way of equipment, including the comfort of linen, cooking facilities, and clean water supply. There were five wards of about 50 beds each. The patients were nearly all irradiation cases.

From a practical standpoint my work was immensely easier there due to better frame of mind of the patients and the fact that they were in hospitals beds instead of on straw mats on the floor as all the preceding cases had been. The routine of putting on and taking off a pair of army combat boots a dozen times a day and being compelled to crawl from patient to patient on my knees, examining eyegrounds in awkward positions, had become very annoying. Capable nurses were on hand to instill mydriatics to a whole ward of patients at a time. The patients soon became very much accustomed to the homatropine and seemed to enjoy having their eyes looked at, particularly those who suffered some loss of vision because of their lesions.

By means of army transportation I was able to travel around the area, visiting a number of the small hospitals, gathering case histories and doing ophthalmoscopic examinations. In this respect I had a great advantage over Japanese workers who, because of the unavailability of transportation, were compelled to remain in one hospital for their study.

I remember a visit to one hospital far up on the hillside very near the hypocenter of the explosion that will leave forever in my mind a picture of the stark misery of those wretched people. Only a jeep could have made the trip. In some places the pathway was no wider than a foot path and the wheels seemed to grasp for a footing on the sharply inclined mountainside. A stone building from which the windows, sash and all, had been blown out and from which the roof had been broken and partially blown away was the "hospital." About 20 patients were lying about on the floor upon loose straw so wet

that water came over the tops of my shoes as I stooped to examine the patients. Some were covered with loose nets but most of them were unprotected from the hordes of flies that came to feed upon their open wounds. A small Japanese man introduced himself as the doctor in attendance. He asked us in a weak though earnest voice if there were any way to help his patients, any medicines the Americans could offer. His hair was sparse and his skin pale. [K rations were brought in next day and the patients evacuated to better quarters.]

By the first of October the number of new cases of irradiation sickness coming to the hospitals was practically nil and it could be seen that further studies would have to be limited to repeated reëxaminations of the cases already under observation. On October 6, 1945, I returned to Tokyo to resume my duties with the 42nd General Hospital.

Review of the literature

From a medical standpoint the casualty picture of the survivors of the atom bombs is unique in the history of man. Experimental studies have been made in great numbers on animals by various investigators.[9,10] Medical literature is replete with reports of injuries and even death due to improper or excessive use of irradiation, but never before this time has the world seen death of human beings in large numbers from total body exposure to penetrating rays.

Concerning aplastic anemia and agranulocytosis, one finds isolated case reports of individual cases described more or less in detail,[1,7] often with special reference to the etiology (usually idiosyncrasy to some drug). Studies of the effects of whole-body irradiation even in animals have never included examination of the eyegrounds as far as the author has been able to determine.[10] Such studies have been focused on the gastro-intestinal tract and the hematopoietic system.[11,12]

Benkwith[2] describes a case which he saw in Nagasaki exhibiting epilation of the hair, and petechial hemorrhages of the skin and mucous membranes. The blood studies showed anemia and leukopenia. A beautiful colored illustration shows the hemorrhagic lesion of the retina. The reader is strongly urged to study this illustration—it is very characteristic.

Schlaegel[6] in his recent article gives a beautiful detailed account of the microscopic pathology of eyes taken at autopsy of fatal cases. The article has a comprehensive bibliography. A singularly distressing fact that has been apparent to more than one of us is that the fundamental, early research on biologic effects of irradiation was made with primitive equipment and the protocols often are not clear as to the physical properties of the energy with which the effects were brought about.[5,9] The remarkable advances made in nuclear physics are such as to make much of this early experimental work nonspecific and of little value as interpreted today.

Clinical studies

At the time of our visit to the atomic-bomb areas at Hiroshima and Nagasaki, it was anticipated that some pathologic changes would be found in the eyes of those survivors who were near the site of the explosion. It was known that a large amount of light was produced by the explosion, and it could be assumed that some detectable damage to the tissues of the eye could have resulted. To the date of the completion of this study, October 6, 1945, no primary damage to the ocular structures has been observed that could be interpreted as the result of irradiation of any sort. The president of the Nagasaki Medical College, Dr. Yamane, who himself died two weeks after the explosion from irradiation sickness, is said to have treated a number of cases of purulent conjunctivitis occurring 3 or 4 days after the blast and lasting about a week. These cases all resolved and the disease did not involve the cornea or leave any permanent sequelae. No bacteria were found in the discharge in

studies made by the Japanese at that time.[3]

No evidence of such a disease was found by us 4 to 6 weeks later, and no patient questioned by us gave a history of such a disease. A number of patients with flash burns of the face who must have been facing the exploding bomb were examined carefully with the pupil dilated using the ophthalmoscope and focal illumination. No opacities could be seen in the lens and no pathologic changes were noted in the cornea or conjunctiva. In fact, the flash burns seemed to spare the eyelids in many cases as if the tight closure of the eyes had occurred quickly enough to hide that area of skin. Some patients were seen who had lost their lashes but epilation of eyebrows was rare.

Lesions resulting from the explosion of the atomic bomb may be divided into three categories:

1. Mechanical injury from the blast.
2. Thermal injury from long-wave energy.
3. Radiational injury from gamma rays and neutrons emitted at the time of detonation.

Mechanical injury from blast

Those lesions resulting from mechanical injury differed in no way from those produced by other explosive agents, such as bullets and shells. Among those noted were penetrating injuries of the globe, leukoma of the cornea, traumatic cataract, various lid deformities including ectropion, symblepharon, ankyloblepharon, detachment of the retina, and various syndromes involving fracture of the skull and walls of the bony orbit. Many ambulatory casualties were seen on the streets wearing eye patches.

Thermal injury from long-wave energy

Effects of the enormous thermal energy released by the explosion were evidenced in the frequency of pigmented flash burns. These were of a copper color and involved only the side facing the explosion. The burned areas had straight-line borders resembling a shadow cast over the upper trunk. There were large numbers of patients exhibiting extensive facial burns of the ordinary type with much dense cicatrix. These burns in some instances had involved the conjunctiva and cornea to such an extent that the red, inflamed, lacrimating eyeball had only slight movement and seemed set in a dense mass of contracting scar.

Radiational injury

It is not in the province of this paper to describe in detail the general picture of the effects of the whole-body irradiation or "radiation sickness" as it has been called. However, a brief outline of these phenomena may help to orient the reader in interpreting the more specific findings of the ocular examinations. From 3 to 5 days after the explosion, many survivors who had been near the hypocenter became acutely ill and completely prostrate with bloody diarrhea. These individuals died within 2 or 3 days, long before our investigation began. Those may be called "acute roentgen deaths." They did not become subjects of our investigation. Accounts of the course of their illness were obtained from the Japanese local medical authorities.[3,10] It is assumed that they all received dosages of irradiation sufficient to cause necrosis of the mucosa of a large part of the gastro-intestinal tract.

Beginning about two weeks after the explosion, a strange, new syndrome appeared. Individuals who had previously been well and apparently free from all injury from the explosion fell ill in large numbers. They manifested extreme weakness, pallor, and loss of hair. Innumerable petechial hemorrhages appeared in the skin and there was ulceration and bleeding from oral mucosa. They became febrile and succumbed in large numbers to invasive pulmonary and pharyngeal infection. Examination of the blood revealed extremely low red-cell and hemoglobin values, low white blood count, particularly the granulocytes, and an extremely prolonged bleeding time with no

clot formation. The condition progressed to death. Such cases appeared in large numbers from the beginning of the third week until the end of the sixth week and brought much speculation from the Japanese as to the probable etiology. At the time of our arrival in Hiroshima, near the end of the fourth week, the death rate in that area was given as 100 per day.

The Japanese were doing numerous autopsy studies on the cases at the time of our arrival and had already demonstrated the lesions of the bone marrow, the lymphoid atrophy, the aplastic blood picture, and the diffuse manifestations of hemorrhagic diathesis.

Many of the patients from Hiroshima were evacuated to Fukuoka, Kyushu, for study and treatment in Kyushu Imperial University. Dr. Toichiro Sawada and Dr. H. Mizusima of the medical faculty there showed us the clinical records of many of these cases, the completeness and detail of which reflected their keen awareness of the situation. Dr. Kosaku Ono of the Pathological Institute has preserved beautiful specimens of autopsy material, particularly of the gastro-intestinal tract. It was in this institution that Ikui[3] made his ophthalmoscopic studies.

The physical state leading to and forming the basis of the ocular lesions I am about to describe is briefly and concisely set forth in the following quotation from Warren:[12]

"The hematopoietic system (marrow and lymph nodes) is so badly damaged by the penetrating gamma and neutron radiation as to appear aplastic on histologic examination. This damage is reflected later in leukopenia, progressive anemia, development of petechiae, prolonged bleeding time with absence of clotting with probably some actual capillary injury to all the vessels in the body. . . ."

Ocular lesions associated with irradiation

Ocular lesions associated with or secondary to irradiation were limited to the retina, as far as clinical features were concerned, and were found in 46 cases. Unfortunately accurate count was not made of all patients examined. A reasonable estimate however, is about 400, of whom approximately 50 were from the Hiroshima area and 350 from the Nagasaki area. Even if these figures were actually known it would be difficult to compute the real incidence of the ocular lesions, since in some instances examination with the facilities available at the time left some doubt as to whether radiation reaction was actually present or not. It was felt that in many cases the ophthalmoscopic examination was useful in establishing a diagnosis of postradiation state in otherwise doubtful cases. I believe it can be stated without reservation that retinal lesions were found in 50 percent of those showing obviously demonstrable signs of whole-body irradiation, that is, epilation, leukopenia, and petechiae of the skin.

The relationship of the blood changes to the retinal lesions is emphasized in the analysis of the data obtained in the clinical examinations (table 3). Of the patients showing these retinal lesions 75 percent had one or more other clinical symptoms of irradiation at the time the study was made. Of 37 cases in which leukocyte counts were available, 28, or 75.7 percent gave figures at some time of 4,000 or below. There were 23 patients under 25 years of age and 23 patients over 25 years of age. Of the four clinical signs found to be typical of irradiation damage—petechiae, gingivitis, angina, and epilation—the group of under 25 had an average of 1.52 while the group of over 25 had an average of 1.22, a difference of about 20 percent. This may indicate a relationship of age to sensitivity to gamma irradiation. However, no correlation whatsoever could be found between the age and the degree or intensity of ocular involvement.

All of the patients in this study were within two kilometers (1.2 miles) of the hypocenter of the explosion. Of all 41 cases, where the information could be obtained,

only 8 (19.5 percent) were outside of a building at the time of the blast. In these cases it must be assumed that some intervening absorptive material, that is concrete, must have protected the majority from gamma-ray dosages that would certainly otherwise have caused them to die before our investigation began.[12] Because of this unknown amount of shielding in any given case, it appears that a correlation of the distances from the explosion with the quality and intensity of the pathologic effects is difficult to compute in spite of the fact that doses received through the air by persons at equal distances were probably the same.

TABLE 1

RELATION OF WHITE BLOOD COUNT TO DISTANCE FROM EXPLOSION

Type Lesion	Number Cases	Average W.B.C.	Average Distance
Exudate alone	10	4,666	1.15 Km.
Hemorrhage alone	14	3,458	1.08
Exudate plus hemorrhage	22	3,156	0.99

The data in Tables 1 and 2 show, however, a definite tendency for the white count to vary directly with the distance from center, and it is felt that if the many extraneous factors such as density of clothing, posture at the time of the blast, intercurrent physical disease, and nonradiational injury could have been properly evaluated the relationship could have been demonstrated more clearly.

Although the factor of sex in the development of the reaction did not seem to be prominent in the cases examined, it may be seen from Table 3 that the average white-cell count was significantly lower for the females than for the males. There is little or no relation between the sex and the ocular lesions found, qualitatively or quantitatively.

It is evident then that, in the case of any given individual at the time of our investigation, we knew only that he had received a dose of irradiation that was either sublethal for him or lethal with a longer latent period

TABLE 2

RELATION OF WHITE BLOOD COUNT TO DISTANCE FROM EXPLOSION

Distance Meters	Number of Cases	Counts Available	Average W.B.C.
0–500	10	10	2,470
500–1000	15	9	3,344
1000–1500	12	11	3,081
1500–2000	8	4	8,950

than other cases had shown. As noted in some of the case histories, serial leukocyte counts made by the Japanese before our arrival indicated that the depth of the leukocyte depression probably took place around the first week in September in the cases alive and available for our clinical appraisal at the time this survey was made.

TYPES OF HEMORRHAGES OBSERVED

The lesions observed in this disease appeared in the retina and were limited to that structure and the nerve-fiber layer as it overlay the nerve head. The hemorrhages were of four types. In order of frequency of occurrence these are: flame hemorrhage, preretinal hemorrhage, "Roth"-type hemorrhage, and vitreous hemorrhage.

Flame hemorrhage is, of course, situated in the nerve-fiber layer of the retina. It is due to the rupture of capillaries in that layer and the infiltration of cellular blood elements between the nerve fibers. These lesions were very numerous, being seen in 25 (54.3 percent) of the cases. They were nearly always situated, as were all other fundus lesions described in this study, close to the nerve head, being rarely seen further than three disc diameters away. Some of the flame hemorrhages were very dense and had

TABLE 3

INCIDENCE OF SEX AND RELATION TO WHITE BLOOD COUNT

Sex	Number	Number Counts	Average W.B.C.
Male	20	16	4,262
Female	26	21	2,976

a deep maroon color, while others were a very pale red and only slightly darker than the uninvolved retinal tissue and underlying choroid. The pallor of these hemorrhages was a striking manifestation of the depletion of circulating hemoglobin. The term "flame hemorrhage" is used in this study to refer only to those lesions in which the reflexes from the internal limiting membrane revealed no change in level as they passed over the lesion. The location in the nerve-fiber layer was often strikingly demonstrated by the extension of the lesion continuously onto the disc itself. Some of these took the form of narrow, splinter shapes often being situated parallel to and very close to a large vessel.

TABLE 4

TYPES AND INCIDENCE OF RETINAL LESIONS

Lesion	Number of Cases	Percent of Total*
Exudate	30	65.2%
Flame hemorrhage	25	54.3%
Preretinal hemorrhage	11	23.9%
"Roth"-type hemorrhage	4	8.6%
Vitreous hemorrhage	2	4.3%

* These percentages do not total 100 because each eye often had more than one type of lesion.

Preretinal hemorrhage occurred in 11 (23.9 percent) of the cases. These seemed to be a gross development of the flame hemorrhage in which the blood had leaked into the subhyaloid space producing an elevated, rounded hematoma immediately adjacent to but not invading the vitreous. These lesions were often quite large and had straight-line, horizontal upper borders due to stratification of the elements of the blood. The surface of the hematoma was smooth and convex as determined by the character of the reflex from it. The surface of these blood masses was granular. The distinguishing ophthalmoscopic features of these lesions were their uniformity of color, their large size, their extremely sharp margins, and the tendency to form horizontal, straight-edged upper margins. The serum of the blood could be dimly seen above the straight edge and was usually clear enough so that underlying retinal vessels could be seen.

"Roth"-type hemorrhage. A unique type of hemorrhage observed in this study resembled nothing so much as a Roth spot except that it was larger. These lesions were noted especially in 4 (8.6 percent) of the cases. They were larger than most flame hemorrhages and were almost invariably seen overlying a large artery, a branch of the first order. The portion of the lesion toward the disc was smoothly and sharply outlined while that away from the disc was brushlike. The color was a deep maroon and the lesion showed elevation of the retinal surface. Somewhere on the lesion, usually on the distal portion, was an irregular, round, white area about one fourth of the diameter of the lesion itself. The pathogenesis of these spots could be made out from a study of the hemorrhage forming in association with the exudates (vide infra).

Vitreous hemorrhage was noted in two cases (4.3 percent). There was an infiltration of the vitreous body itself by blood which had burst through the hyaloid. The view of the fundus was always more or less obscured in this type of hemorrhage.

Exudation into the retina was a most common finding in these cases (30 or 65.2 percent). It took the form of round, snow-white, slightly elevated lesions obscuring the retinal vessels. They were usually about one-fourth disc diameter in size. These spots were always within three disc diameters of the disc and were sometimes extremely numerous, 40 or 50 being seen in a single eyeground. The spots were scattered in random fashion over the polar zone of the retina without any reference to blood vessels.

In some of the cases, however, it was noted that occasionally a lesion situated near an artery would show a fine fringe of hemorrhage about its borders, particularly its peripheral or distal border. Some were seen

in which this hemorrhage became large and came to surround the exudate. This led me to believe that such a hemorrhage about an exudate could develop into a hemorrhage of the so-called "Roth" type described above.

The morphologic variations noted in these exudates were rather marked. The most common type was, as described, round and smoothly elevated with a feathered margin indicating that it was an involvement of the nerve-fiber zone. Elongated forms were also seen and a peculiar zig-zag formation in which the extension in length was in a direction perpendicular to the direction of the nerve fibers composing the lesions. Also in these the area of exudation would not everywhere be equidistant from the disc, producing a "Z" shaped figure (fig. 1). In some cases this development became so marked that these exudates formed one or more rings or wreaths partially surrounding the disc.

Subsequent observation of the lesions showed their borders to become sharper as they absorbed in contrast to the hemorrhages in which the borders became more indefinite as absorption progressed. A late residue of an old exudate is a small waxy, yellowish, sharply outlined plaque associated with several much smaller satellite spots. In some instances rather large sharply outlined grayish speckled areas were seen surrounding a large artery. These could very well represent residual atrophy from absorption of one of the larger hemorrhages.

No changes were observed in the optic discs nor were any pathologic changes noted in the vessels themselves. Generalized retinal edema was a very common accompaniment of hemorrhages and exudates so that if edema was present a search for a local pathologic condition was more intensively pursued.

Microscopic findings

Microscopic examination of the eyeballs removed at autopsies done in Hiroshima and Nagasaki has been carried out by Mrs.

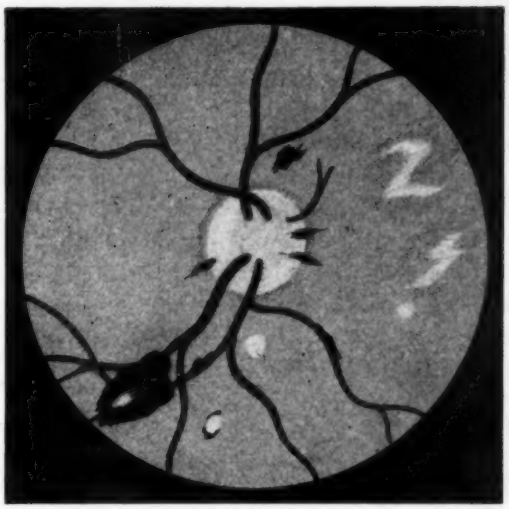

Fig. 1 (Flick). Composite drawing representing the different morphologic types of fundus lesions seen. The hemorrhages are in black and the exudates in white.

H. C. Wilder of the Army Institute of Pathology, Washington, D.C., and also by Dr. T. F. Schlaegel, Jr., of the Indiana University School of Medicine, with both of whom I have conferred personally at length on the findings. It is an unfortunate fact that none of the cases appearing in my report furnished any material for microscopic study and in none of the autopsy specimens examined critically had a clinical examination of the eyegrounds been made.

Of 18 eyes examined by Wilder, 15 showed degenerative changes in the lens; one eye showed a conjunctival hemorrhage; one eye, a retinal hemorrhage; one eye, swollen areas in the nerve-fiber layer resembling cytoid bodies; and 17 eyes showed septic choroiditis. These eyes had been removed 24 to 33 days after the explosion and none had been examined ophthalmoscopically.

Since studies by the Japanese showed that the peak of the leukocyte depression occurred about the end of the fourth week, it is entirely possible that eyes removed in the third and fourth week after the explosion would not reflect the pronounced blood changes that they would have showed

if the individual had survived another 2 or 3 weeks. This explains the absence of hemorrhage in the retina on microscopic examination and also the packing of the choroidal vessels with inflammatory cells.

Regarding the lens changes, there is little to be said at this time. I examined dozens of eyes with the pupil dilated but saw no lens opacities. At no time was my view of the fundus hampered by opacities of the media that I could localize in the lens. I have been extremely interested myself in the swollen areas in the nerve-fiber layer. (This condition is shown in figures 4, 5, and 6.)

These lesions were lenticular in shape, protruding slightly into the vitreous chamber and depressing the inner nuclear layer. The lesion itself is somewhat granular and the nerve fibers become blurred in outline as they pass through the lesion. The color of the stain is grayish pink and the center of the lesion has an amorphous appearance. These lesions could be the areas of edema seen with the ophthalmoscope as white exudates.

Schlaegel in his recent report[6] found no microscopic evidence of the retinal lesions

TABLE 5

TABULATION OF HISTORICAL DATA

No.	Name	Age and Sex	Dist. Km.	Date Onset	Manifestations*	W.B.C. Date	Location When Bombed	Eye Lesions
1	Ogawa	22 ♀	1.0	9-5	1-2-3-4-5-6	3,200	inside	Macular hemorrhage, exudative plaque
2	Hirota	19 ♀	1.0	8-19	1	3,300	inside	Detached retina, membrane behind lens
3	Matuda	18 ♀	1.0	9-8	1-2-3-4-5-6	2,300	inside	Preretinal hemorrhage, Roth spots, flame hemorrhage.
4	Yoshino	64 ♂	0.1	8-29	—	1,100	inside	Flame hemorrhage, plaques
5	Miyasaki	25 ♀	1.5	9-5	3-5-7	3,200	inside	Preretinal hemorrhage
6	Matsubayashi	49 ♂	2.0	9-14	1	7,800	inside	Soft, white exudate
7	Tasaki	16 ♀	0.0	9-5	1-3-4-5-7	2,400	in concrete house	Exudate, preretinal hemorrhage
8	Tawara	20 ♀	0.0	8-26	1-4	3,100	in concrete house	Exudate, preretinal hemorrhage
9	Ito	24 ♀	0.6	9-7	3-4	1,500	outside	Flame hemorrhage, Preretinal hemorrhage, exudate
10	Hashimoto	14 ♀	1.0	9-10	1-2-3-4-6-7	4,000	inside	Vitreous hemorrhage, preretinal hemorrhage, flame hemorrhage.
11	Hashimoto	50 ♂	0.5	9-11	6	2,400	outside	Flame hemorrhage.
12	Narita	32 ♀	2.0	8-14	6	—	inside	Exudate, flame hemorrhage.
13	Kurokawa	31 ♀	1.0	8-18	—	6,100	outside	Exudate
14	Yokoyama	59 ♀	1.0	8-9	4-7	3,600	wood house	Exudate
15	Momoki	14 ♀	0.2	9-11	7	1,200	wood house	Hemorrhage, exudate
16	Kitagawa	67 ♂	2.0	8-9	—	13,800	outside	Hemorrhage, exudate
17	Kataoka	25 ♀	1.5	8-11	3-5-6	—	outside	Exudate
18	Iwanaga	18 ♀	1.7	8-25	2-3-5	—	wood house	Hemorrhage, large
19	Tsujimaru	38 ♀	1.6	8-23	3-5	—	doorway toward blast	Flame hemorrhage
20	Sugino	56 ♀	0.8	8-24	4-6-7	—	wood house	Exudate, flame hemorrhage
21	Kawano	23 ♀	1.0	8-17	3-4-6-7	—	wood house	Exudate
22	Nanri	20 ♀	1.0	9-5	3-4-6-7	— 500	in house	Exudate
23	Fujihara	24 ♂	0.5	8-9	5-7	6,000	in house	Exudate
24	Kaneshiro	34 ♂	1.2	—	—	—	in house	Exudate, hemorrhage
25	Ota	67 ♂	0.8	8-9	4	—	in house	Hemorrhage, exudate
26	Nakamura	18 ♂	0.8	8-29	6	—	in house	Retinal edema
27	Hirana	51 ♂	1.7	8-17	—	—	in house	Absorbing hemorrhage, exudate
28	Inaba	22 ♂	1.2	9-13	3-6-7	3,000 (9-26)	in house	Exudate, flame hemorrhage
29	Takemoto	43 ♀	1.2	8-19	6-7	800 (8-23) 4,300 (9-12)	outside	Vitreous hemorrhage, exudates
30	Furuta	18 ♀	1.2	8-15	3-6	3,000 (9-26)	inside	Exudate, flame hemorrhage
31	Ando	18 ♂	0.8	8-28	—	2,600 (9-26)	inside	Roth spot
32	Niigaki	25 ♀	1.2	9-20	1-3	2,500 (9-20)	in house	Exudate, flame and preretinal hemorrhage
33	Okamura	30 ♀	0.5	9-9	1-6	2,400 (9-20)	in house	Flame hemorrhage
34	Hirayama	30 ♀	—	—	—	3,600 (9-25)	—	Exudate, preretinal and flame hemorrhages
35	Morinoki	59 ♂	1.2	8-25	1-3-4-7	7,200 (9-1)	outside	Exudate, hemorrhages
36	Kagiya	23 ♂	2.0	—	5	7,200 (9-21)	inside wood house	Hemorrhage
37	Azuma	31 ♂	2.0	8-29	1-2-3-4-6-7	7,000 (9-26)	inside	Preretinal and flame hemorrhages
38	Kuromiya	34 ♀	1.5	8-9	6	2,000 (9-3)	inside	Exudate, hemorrhages
39	Matsuo	49 ♂	1.2	8-23	2-3-6	600 (9-21)	outside	Exudate, flame hemorrhage, Roth spots
40	Ishita	42 ♂	1.2	8-19	1-3-4-6	4,800 (9-28)	inside	Exudate
41	Unknown	24 ♂	0.5	9-6	1-2	2,000	—	Hemorrhage, exudate
42	Unknown	25 ♂	0.0	9-1	3	900	inside	Massive hemorrhage, exudate
43	Yoshida	26 ♂	1.0	8-24	1-2-3-6-7	2,200 (9-6)	—	Flame hemorrhage
44	Matsumoto	45 ♀	1.5	9-9	1-2-3-5-6-7	2,500 (9-9)	—	Exudate
45	Iwatsu	7 ♀	1.0	9-10	2	2,800 (9-10)	—	Exudate flame hemorrhage
46	Imafuku	31 ♂	0.5	9-13	1-2-5-7	3,800 (9-30)	inside	Flame hemorrhage

* 1—weakness; 2—petechiae; 3—gingivitis; 4—headache; 5—angina; 6—epilation; 7—fever.

seen clinically. He, too, found the septic choroiditis and evidences of lens degeneration. His paper, which is a remarkable contribution from a documentary standpoint, contains an interesting table showing the increased thickness of the lens capsule in these eyes.

Case histories

The reports submitted in this account represent free translations of histories taken through interpreters. It was felt that a good deal of the realism of the stories told of individual experiences was lost through imperfect and sometimes impossible rendition of the Japanese idiom. The interpreter's lack of knowledge of English frequently resulted in misunderstanding.

Case 1

History. Ogawa, a Nagasaki woman, aged 22 years. This patient was in the Mitsubishi weapons factory one Km. from the center of the explosion inside a concrete building. She was dressed in a blue, one-piece suit with long trousers and Japanese sandals. She suffered no burns or wounds. One hour after the explosion she vomited. Nausea continued for two or three days with loss of appetite.

Beginning on August 13th, she had diarrhea for five days but there was no blood in the stool. Her hair began to fall on the 26th of August and she became bald. From September 1st to 7th she suffered from bleeding of the gums and tonsillitis with high fever. During that time she also had severe nose bleeds.

Since September 15th (now October 6th) she had had poor vision in the right eye. She menstruated five days before the explosion. She began to bleed again on the 25th and had been bleeding continuously at the time these studies were made.

On September 24th, the leukocyte count was 8,600, and the sedimentation rate was 50 mm. for the first hour and 64 mm. in two hours.

Eye examination. On September 21st, the eyegrounds were examined at Shinkozen Hospital and the following descriptive note written:

"Examination of the fundus of the right eye (fig. 3) reveals an appreciable amount of retinal edema generally, particularly pronounced in the macular region. The veins and arteries are full and of good color. There are no pathologic changes in the optic discs. In the foveal region is a deep-red, preretinal hemorrhage one-fourth disc diameter in size and laterally oval in shape. The lesion shows marked bulging into the vitreous and the borders are very sharply defined. Above this is a very much larger, although similar lesion, about three disc diameters in size. This lesion is elevated and

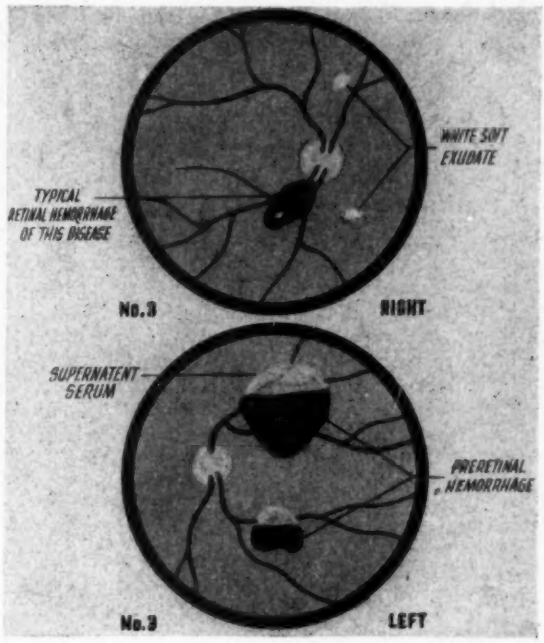

Fig. 2 (Flick). Both eyegrounds of Case 3, showing large lesions.

the lower margin is very sharp. The upper margin is horizontally straight. The lesion is situated 1 to 2 disc diameters from the papilla.

"Scattered about in the intervening retina are numerous small flame-shaped hemorrhages and several white, fluffy, elevated exudates, particularly on the nasal side. The left fundus shows no hemorrhage but numerous exudates of the soft white type."

On October 5th, 15 days later, the following note was made on reëxamination of the eye grounds: "The large preretinal hemorrhage above the macula is 2½ disc diameters in size and shows little evidence of absorption. The hemorrhage in the macula shows some evidence of absorption and has a whitish spot in the center. One small fresh exudate is present with no hemorrhage around it."

Case 2

Hirota, a Nagasaki woman, aged 19 years, had been ill since August 19th. Her only symptoms were severe weakness and poor vision in the left eye. The leukocyte count on admission was 3,300. She had been one Km. (0.6 miles) from the center of the explosion. The right eye was normal in every respect. The left eye, with pupil dilated, showed blood behind the lens with oblique illumination. The fundus could be dimly seen, and it seemed likely that there was detachment of the lower portion of the retina.

Case 3

History. Matuda, a Nagasaki woman, aged 19

years, was one Km. (0.6 miles) from the center of the explosion, inside, at the time of explosion. She became ill on September 8th and developed sore throat, fever, petechiae of the skin, and extreme weakness.

Eye examination. "The right fundus (fig. 2) showed numerous massive hemorrhagic extravasations. Below and temporal to the disc is a very large preretinal hemorrhage that has burst forth from the nerve-fiber layer and protrudes into the vitreous. The lower portion of this lesion is of a yellowish color similar to the so-called 'Roth spot' seen in sepsis. Many small, whitish, elevated, fluffy exudates are seen scattered over the intervening retina. The disc is normal. The large hemorrhage seems to cover the inferior temporal artery and vein near the disc. The left fundus (fig. 2) shows two large preretinal hemorrhages, a very large one above the disc and a smaller one below. These lesions are, respectively, 4 and 3 disc diameters in size. The upper one has an irregular lower border and a flat upper border indicating the level of the settled red cells. The surrounding retina is extremely edematous and the supernatant fluid is slightly cloudy. Numerous small white fluffy exudates are seen scattered about."

CASE 4

Yoshino, a Nagasaki man, aged 64 years, had been ill since August 29th with weakness. He had been only 100 meters (0.06 miles) from the explosion, inside a house. His leukocytes numbered 1,100. Only the right eye (fig. 3) could be examined.

"There are no changes in the optic disc. A small area 1½ disc diameters in size surrounds the inferior temporal vein and consists of a speckled, whitish gray area, as if moth-eaten. The borders are sharp and there is no elevation. There is such a spot also located above the disc in relation to the superior temporal artery and vein. Near the lower spot is a very superficial nerve-fiber layer hemorrhage. One small preretinal hemorrhage is seen just above the disc."

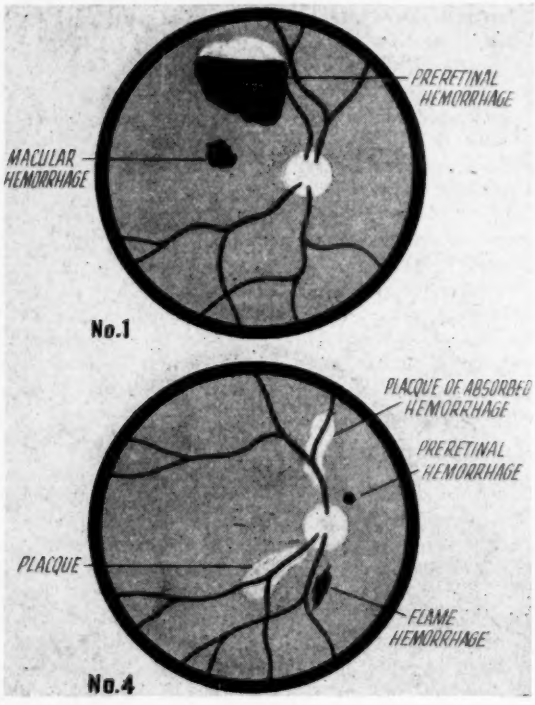

Fig. 3 (Flick). Right eyeground of Case 1, showing macular hemorrhage. Right fundus of Case 4 shows plaques of absorbed hemorrhage.

CASE 5

Miyasaki, a Nagasaki woman, aged 25 years, began her illness on September 5th. The white-cell count was 3,200. There was a moderately large globular hemorrhage of the lower portion of the right fundus.

CASE 6

Matsubayashi, a Nagasaki man, aged 49 years, had been ill since September 14th with ill-defined symptoms. The white-cell count was 7,800. The eyegrounds showed numerous white, soft exudates but no hemorrhage.

CASE 7

Tasaki, a Nagasaki woman, aged 16 years, was at the center of the explosion inside a concrete house. She had been ill since September 5th with extreme weakness. The white-cell count was 2,400. The eyegrounds showed globular hemorrhages and white, soft exudates. The doctors who had treated numbers of the cases said she would surely die.

CASE 8

Tawara, a Nagasaki man, aged 20 years, was also at the center of the explosion inside a concrete house. He became ill on August 26th with extreme prostration and weakness. His white-cell count was 3,100. The eyegrounds showed several large subhyaloid hemorrhages and some white, soft exudates.

CASE 9

Ito, a Nagasaki woman, aged 24 years, had been ill since September 7th. This patient had been 600 meters (one mile) from the center of the explosion, outside. This patient was in extremis. The white-cell count was 1,500. The eyegrounds showed large, globular preretinal hemorrhages, many flame hemorrhages and small, soft, white exudates.

CASE 10

Hashimoto, a Nagasaki woman, aged 14 years, gave no history. The vitreous of the left eye was almost entirely obscured by dense hemorrhage, the lower portion only being visible with the ophthalmoscope. In the right eye were seen a large peripapillary hemorrhage as well as flame hemor-

Fig. 4 (Flick). Lesion of nerve-fiber layer close to nervehead, showing swelling and displacement of outer retinal layers.

rhages and vitreous hemorrhages. There were many white, soft exudates but no papilledema. The leukocyte count was 4,000.

CASE 11

Hashimoto, a Nagasaki man, aged 50 years, was entirely epilated. He had been 500 meters (0.3 miles) from the center of the explosion. There was one small flame hemorrhage temporal to the right disc but no exudates. Leukocyte count was 2,400.

CASE 12

Narita, a Nagasaki woman, aged 32 years had been two Km. (1.2 miles) from the center of the explosion, indoors. There was complete epilation. She had had diarrhea for two days and had been ill since August 14th. There were numerous small white exudates and one small splinter hemorrhage.

CASE 13

Kurokawa, a Nagasaki woman, aged 31 years, had been one Km. (0.6 miles) from the center of the explosion, outdoors. She had become ill on August 18th. The white cells numbered 6,100. There was one small exudate in the left lower fundus.

CASE 14

Yokoyama, a Nagasaki woman, aged 59 years, had, at the time of the explosion, been in a wooden house one Km. (0.6 miles) from the center of the explosion. She became ill on August 9th, the day of the explosion, probably due to the fact that she suffered many primary injuries. The white-cell count was 3,600. There was one small exudate in the right upper temporal region near the disc.

CASE 15

Momoki, a Nagasaki girl, aged 14 years, became ill on September 11th, with nosebleeds and fever. She had been only 200 meters (0.12 miles) from the center of the explosion inside a wooden house. The white cells numbered 1,200. There were great numbers of small exudates scattered about the posterior pole of both eyes. There was also much general retinal edema. One flame hemorrhage extended onto the disc in the left eye.

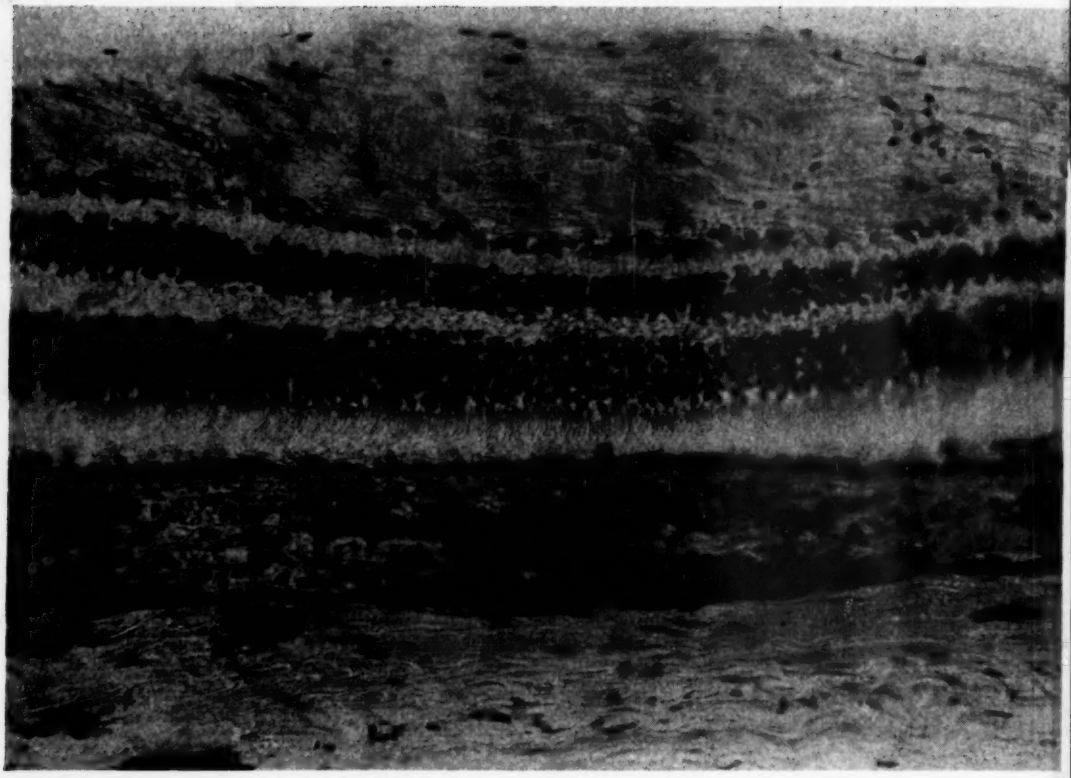

Fig. 5 (Flick). Higher-power view of same lesion as in Figure 4. The granular appearance and loss of fibrillar structure in the nerve-fiber layer in this lesion can be seen.

CASE 16

Kitagawa, a Nagasaki man, aged 67 years, had been outdoors two Km. (1.2 miles) from the center. He had been continuously ill since the explosion with febrile illness. There were no other manifestations of radiation injury. The white count was 13,800. There was a small, white exudate near the left disc, and splinter hemorrhages surrounded the right inferior temporal vein.

CASE 17

Kataoka, a Nagasaki woman, aged 25 years had been 1,500 meters from the center of the explosion, outside. She became ill on August 11th. There was generalized flash burn over neck, arms, and legs. No other evidences of radiation injury were present except the marked oral sepsis with gingivitis and hemorrhagic ulceration of the throat. The eyegrounds showed many white exudates.

CASE 18

Iwanaga, a young Nagasaki woman, aged 18 years, was inside a wooden building at the time of the blast, 1,700 meters away (1.02 miles). She lost her hair on August 25th and became quite ill on September 1st, with gingivitis, sore throat, purpuric spots on the skin, and bloody sputum. The eyegrounds showed one large typical hemorrhage.

CASE 19

Tsujimaru, a Nagasaki woman, aged 38 years was standing in the open doorway toward the blast at the time of the explosion. This was approximately 1,600 meters (one mile) from the center. Two weeks later she began to suffer from bleeding gums and pharyngitis. The left fundus showed one flame hemorrhage.

CASE 20

Sugino, a Nagasaki woman, aged 56 years, was standing in a wooden house near Urakami station, Nagasaki, 800 meters from the center (0.48 miles). There were no burns or wounds. Beginning two weeks after the explosion she became ill with headache, fever, and prostration. Many small hemorrhages of the flame type and many small exudates were found in the eyegrounds.

CASE 21

Kawano, a Nagasaki woman, aged 23 years, had been standing in a wooden house 1 Km. (0.6 miles) from the center. She gave a history of having soreness of the gums and headache for an indefinite period of time. The hair began to fall on August

17th. From August 10th to 17th, she had a temperature of 39° to 40°C. There was a small wound of the left hand and some bruises but no burns. The last menstrual period was July 1st. Examination with the ophthalmoscope revealed one small exudate in one retina, no hemorrhages.

CASE 22

Nanri, a young Nagasaki woman, aged 20 years, was sitting indoors working as a secretary in the Mitsubishi arms factory one Km. (0.6 miles) from the center. She began to notice a dizziness on September 5th. She also began to notice at that time a soreness of the gums which lasted about eight days. She had a headache and fever up to 40°C. On September 9th she began to have diarrhea with 2 to 3 soft, reddish stools per day. On September 5th: white-cell count, 500; red-cell count, 3.4 million; September 10th: white-cell count, 3,200; September 22nd: white-cell count, 4,800. The left eyeground showed one small exudate.

CASE 23

Fujihara, a Nagasaki man, aged 24 years, was a medical student at the Nagasaki Medical College located 500 meters from the center. He was inside a heavy concrete building. On August 29th, he developed a temperature up to 39°C., with angina of the throat which was diagnosed as diphtheria but persisted until September 14th. During this time the white cells numbered 12,000; at the time of this study they numbered 6,000. He also suffered a compound fracture of the left femur and lacerations of the arms, head, neck, breast, and left side of the abdomen. Eyegrounds showed two small, thin exudates but no hemorrhages. (Practically all persons in the medical-school area died.)

CASE 24

Kaneshiro, a Nagasaki man, aged 34 years, was at Ohashi, 1.2 Km. from the center. He was standing outside. There was deafness of the right ear without pain or tinnitus. Numerous minor burns were present. There were several small exudates and splinter hemorrhages in the eyegrounds.

CASE 25

Ota, a Nagasaki man, aged 67 years, was 800 meters (0.48 miles) from the center of the explosion inside the arms factory at Urakami. He was standing up outside. The eyegrounds revealed many small exudates and splinter hemorrhages.

CASE 26

Nakamura, a Nagasaki youth, aged 18 years, was also in the arms factory, standing up, 800 meters (0.48 miles) from the center. He began to lose his hair on August 29th. There was marked diffuse retinal edema but no local or focal lesions were seen.

CASE 27

Hirana, a Nagasaki man, aged 51 years, was

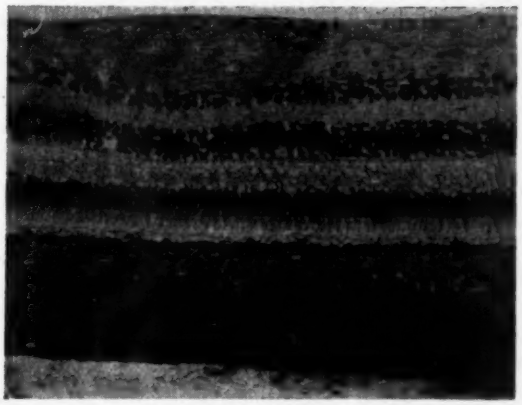

Fig. 6 (Flick). Another lesion in the same section. Note the excellent structural preservation of the retinal elements.

1,700 meters (1.02 miles) from the center, standing outside but protected by a brick wall 4 meters away. From August 20th to 30th he had diarrhea of 1 to 2 stools a day. An absorbing hemorrhage was seen in the right eye. The left eye showed a typical "Roth-type" hemorrhage with white distal portion.

CASE 28

Inaba, a Nagasaki man, aged 22 years, was at the arms factory at the time of the explosion. He was admitted to the hospital on the day of the explosion but his present illness did not begin until August 19th when his hair began to fall. He was bald for about one month when his hair began to grow back. In the meantime he had sore gums, pharyngitis, and diarrhea with black stools. The eyegrounds showed many exudates in the right fundus, nasal to the disc. There were no hemorrhages. The left fundus showed changes similar to those in the right, but there were some absorbing hemorrhages in the left.

CASE 29

Takemoto, a Nagasaki woman, aged 43 years, was at Ohashi near the arms factory. Epilation began on August 16th. She had a severe "cold" with fever up to 40°C. On August 23rd, white-cell count, 800; red-cell count: 4.04 million; Hemoglobin, 55 percent; color index, 0.68. On September 12th, white-cell count, 4,300. The left fundus showed numerous absorbing hemorrhages of the lower portion.

CASE 30

Furuta, a young Nagasaki woman, aged 18 years, was in Ohashi in a wooden house. She states that at the time of the explosion she was blinded and could not see for three days. From August 15th to 18th she had fever up to 40°C. At this time the cuts she had began to be infected. Fever recurred, September 4th to 14th, up to 40°C., and there was soreness of the gums and tonsillitis.

She also complained of nausea, increased salivation, and pain in the abdomen. There were three small exudates in the upper nasal fundus of the right eye. The left eye showed small exudates with some subsiding retinal edema.

CASE 31

Ando, a Nagasaki youth, aged 18 years, was in a wooden house. There was inability to open the mouth for a long time (tetanus?). There was diarrhea for two days without blood on August 28th and 29th. There was some infection of the right wrist reaching its height about September 1st. Examination of the eyegrounds revealed one small hemorrhage of the "Roth" type.

CASE 32

Niigaki, a Nagasaki woman, aged 25 years, was near the Mitsubishi arms factory and was injured by falling building material. She was three months' pregnant and abortion occurred on September 1st. She developed pallor and gingival bleeding on September 20th that lasted five days. On September 24th, the sedimentation rate was 140 for one hour, and 168 for two hours. The leukocyte count was 2,500. There were many flame and preretinal hemorrhages, and exudates in both eyes.

CASE 33

Okamura, a Nagasaki woman, aged 30 years, was located 500 meters (0.3 miles) from the center, inside a wooden house. On September 9th her hair began to fall out. On September 20th the white cells numbered 2,400. She had missed one menstrual period. The eyegrounds showed one flame hemorrhage.

CASE 34

Hirayama, a Nagasaki woman, aged 30 years, gave no history. There were preretinal and flame hemorrhages in the eyegrounds, as well as some exudates of the usual type.

CASE 35

Morinoki, a Nagasaki man, aged 59 years, had been 400 meters west of the Ohashi arms factory or about 1,200 meters (0.72 miles) from the center of the explosion. He was standing outside. Beginning on August 25th, there was increasing weakness, swelling, tenderness and bleeding of the gums, and fever up to 41°C. He complained of pain in the chest and some ringing in the ears. On admission to the hospital it was found he had sloughing of the anterior portion of the soft palate which seemed to result from the extension of the gingival ulceration. Ophthalmoscopic examination revealed several soft exudates and splinter hemorrhages extending to the disc. Reexamination eight days later revealed one small exudate temporal to the left disc. The hemorrhages were seen to be absorbing.

CASE 36

Kagiya, a Nagasaki man, aged 23 years, was two Km. (1.2 miles) from the center of the explosion. He had diarrhea and sore throat with nose bleeds on September 8th. A few splinter hemorrhages, found in the eyegrounds, had completely disappeared in eight days.

CASE 37

Azuma, a Nagasaki man, aged 31 years, was sitting inside the arms factory 800 meters from the explosion (0.48 miles). He began to notice dizziness and weakness on September 17th and noticed that his skin was covered with petechiae. There were also painful soreness of the gums, headache, and falling of the hair which started on August 19th. There was fever up to 40°C. and tonsillitis. The eyegrounds showed many flame and preretinal hemorrhages and also exudates. On reëxamination eight days later, hemorrhages were recorded as very numerous in both fundi. These were of the flame and preretinal type. There were a few exudates. A few typical "Roth-type" lesions were seen, related to the left inferior temporal artery. There was one exudate just temporal to the right disc. Two preretinal hemorrhages, related to the superior and inferior temporal arteries of the right fundus, were seen.

CASE 38

Kuromiya, a woman, aged 34 years, was inside a wooden house 1.5 Km. away from the center at the time of the explosion. The hair began to fall on August 22nd. The patient states she had bloody diarrhea for several days after the explosion. She had not menstruated since the explosion. On September 3rd, the white cells numbered 2,000, and the sedimentation rate was 130 for the first hour and 160 for two hours. Both eyegrounds showed exudates and hemorrhages. Reëxamination eight days later showed one exudate nasal to the left disc. There was an area of absorbed hemorrhage around the proximal part of the superior nasal artery. This had the appearance of the typical "Roth-type" hemorrhage of this disease. There were no lesions seen in the right eye.

CASE 39

Matsuo, a Nagasaki man, aged 49 years, had been at Ohashi factory 1 to 2 Km. (0.6 to 1.2 miles) from the center and had been standing outside. The hair began to fall on August 23rd. Sore throat with fever up to 39°C. came the first week in September. He also had petechial eruption in the skin and sore, painful gums. His record showed:

	Sept. 6	Sept. 8	Sept. 10	Sept. 13	Sept. 15	Sept. 20	Sept. 24
R.B.C.	3.7	3.3	2.7	2.2	2.2	2.6	3.0
W.B.C.	600	500	700	1,100	3,400	3,600	3,000
H.B.G.	65%	60.9%	50%	55%	48%	50%	58%
C. Ind.	0.89	0.91	0.9	1.2	1.0	0.96	0.96
Bl. T.	3½	12	12	10	7	6	5
Cl. T.	3.16	3.16	3.16	3.15	3.14	3.14	5

On September 27th the examination revealed many exudates and hemorrhages of all kinds. On October 5th, there were numerous exudates with sharp borders indicating absorption but no hemorrhages were seen. In the right eye, there was a lesion of the upper temporal region and, in the left eye, one below the disc.

CASE 40

Ishita, a Nagasaki man, aged 42 years had been at the Ohashi factory inside a wooden house at the time of the explosion. On August 19th he had weakness, sore gums, and falling of the hair. He was hard of hearing in the left ear. Many exudates were seen in both fundi. Reëxamination eight days later showed the exudates to be smaller, whiter, more waxy and they seemed to be broken up into numbers of smaller deposits.

CASE 41

This Hiroshima man, aged 24 years, had been 500 meters (0.3 miles) from the center of the explosion of the bomb that had fallen on Hiroshima. He was examined on September 10th and had had purpuric anemia for five days at that time. His leukocyte count at that time was 2,000. The eyegrounds showed massive retinal hemorrhage around the discs in both eyes. There were subhyaloid and nerve-fiber hemorrhages and "Roth" spots in the right eye. The hemorrhages had sharp margins indicating their preretinal location. There were many edema exudates and some swelling of the macula but no changes in the discs.

CASE 42

This Hiroshima man, aged 25 years, was at the center of the explosion. He had been ill 10 days by September 10th. The leukocyte count was 900. The eyegrounds showed large edema exudates near the discs with globular subhyaloid hemorrhages. It was the hemorrhages in this case that first suggested to me their similarity to Roth spots. There was a macular hemorrhage in one eye.

CASE 43

Yoshida, a Hiroshima man, aged 26 years was seen in Fukuoka where he had been evacuated from Hiroshima after the bombing. Patients from both areas were being studied together at the Imperial Kyushu University Hospitals. He suffered from sore gums, petechiae, and fever which had its onset about August 24th. His record showed:

Date	White-Cell Count
September 9th	2,300
September 22nd	2,700
September 29th	3,100
September 30th	6,800

The eyegrounds showed flame hemorrhages.

CASE 44

Matsumoto, a Hiroshima woman, aged 45 years, was 1.5 Km. (0.9 miles) from the center of the explosion. She had petechiae, loss of hair, sore throat, and gingivitis with fever. These entries showed:

Date	White-Cell Count
September 9th	2,500
September 22nd	2,700
September 27th	3,600
September 30th	3,800

The eyegrounds showed many exudates but no hemorrhages.

CASE 45

Iwatsu, a Nagasaki girl, aged seven years, was one Km. from the center of the explosion. She developed petechiae and epistaxis.

Date	Red Cells	White Cells	Hemoglobin
September 10th	2.3	2,800	45%
September 13th	2.1	1,200	54%
September 17th	1.5	1,200	46%

There were exudates and flame hemorrhages in the eyegrounds.

CASE 46

Imafuku, a Nagasaki man, aged 31 years, was a student in the Nagasaki Medical College, one Km. (0.6 miles) from the center. The onset of the illness was September 13th, when he developed petechiae, fever, and angina with marked painful involvement of the tongue. He was examined at Kyushu Imperial University. There was no epilation.

Date	Red Cells	White Cells	Hemoglobin
September 13th	3.6	5,500	——
September 18th	——	——	51%
September 30th	1.74	3,800	——

The retina showed flame hemorrhages.

CONCLUSION

The transient nature of the condition and the chronologically short period over which the studies were made tend to relegate to the order of indulgent speculation any definite conclusions as to the pathogenesis of these lesions. As a result of repeated examinations of the same individuals and of repeated examinations of the same lesions it seemed likely that the exudative lesions represented the milder involvement. This is borne out statistically in Table 1. It seems that those individuals showing both hemorrhage and exudation were on the average closer to the site of the explosion and had lower white-cell counts than did those with either hemorrhage or exudation alone. The witnessing of a transition from the fluffy

exudate to the "Roth"-type hemorrhage and preretinal hemorrhage was rather impressive. It would seem logical to conclude that local areas of the retina could become swollen by transudation of serum through the walls of hyperpermeable capillaries in the presence of anemia, oligocythemia, and consequent lowered oxygen tension in the blood. If this process were to become so intense as to cause tissue breakdown in the lesion itself as a result of stasis and anoxemia, the extravasation of whole blood elements could occur superimposing itself on the original lesion, coming to surround it as "the hemorrhage with the white center."

The location of these lesions near large vessels is explained by the increased intravascular pressure in vessels of larger size. Once engendered by complete vascular rhexis the bleeding is not halted or modified by the clotting mechanism since practically none exists. The tendency of the preretinal blood to settle in layers is no different from its behavior in the sedimentation test tube. The spotty localization of the retinal lesions is probably based on slight local anatomico-physiologic differences in the circulation in the fine branches of the terminal retinal vessels.

It seems safe to conclude that the ocular lesions here described are directly related to the deficiency in blood elements and in no way directly related to the action of radiant energy on the eye. The lesions were observed to disappear in those individuals recovering from the hematopoietic depression with no residual damage to the eye. It is felt that this healing occurred in all patients who survived the irradiation and that no permanent residual damage of permanent nature resulted from the retinal lesions. As to the vexatious question of radiation damage to the lens, time alone will tell.

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References

1. Agatston, S. A.: Relation of blood dyscrasia to retinopathy. Arch. of Ophth., **32**:388 (Nov.) 1944.
2. Benkwith, K. B.: Retinal hemorrhage as seen in an atomic bomb casualty. A. J. Ophth., **29**:799 (July) 1946.
3. Ikui, H., Dept. of Ophthalmology, Kyushu Imperial University. Personal communication at Nagasaki, September, 1945.
4. Larkin, J. C.: The distribution of radiation in the atomic bombing of Nagasaki. A. J. Roent., **55**:525 (May) 1946.
5. Pfahler, G. E., *et al.:* Experimental studies on the combined effects of roentgen rays and ultraviolet rays. A. J. Roent. **16**:150 (Aug.) 1926.
6. Schlaegel, T. F., Jr.: Histopathology of atomic-bomb casualties. A. J. Ophth., **30**:127 (Feb.) 1947.
7. Tassman, I. S.: Ocular changes in the blood dyscrasias. Arch. of Ophth., **37**:42 (Jan.) 1947.
8. Timmes, J. J.: Radiation sickness in Nagasaki: Preliminary report. U. S. Naval Med. Bull., **46**:219 (Feb.) 1946.
9. Tsuzuki, Masao: Experimental studies on the biological action of hard roentgen rays. A. J. Roent., **16**:134 (Aug.) 1926.
10. ———, Department of Surgery, Tokyo Imperial University. Personal communication during our association on expedition.
11. Warren, S. L., and Whipple, G. H.: Aplasia of marrow and fatal intoxication in dogs produced by roentgen radiation of all bones. J. Exper. Med., **53**:421 (Mar.) 1931. Also see other papers on related subjects.
12. Warren, S. L., University of Rochester. Personal communication during expedition. November, 1946.
13. Buxton, R. J.: Retinal hemorrhages in aplastic anemia. Brit. J. Ophth., **29**:632 (Dec.) 1945.

THE ROLE OF THE DIENCEPHALON IN REGULATING OCULAR TENSION*

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This study is a part of an investigation of factors which influence ocular tension. In a previous publication[1] the normal range of ocular tension and rigidity was ascertained in rabbits with a Schiøtz tonometer. Average values and standard deviations were established. The purpose of this presentation is to determine the role played by the cerebral cortex and the diencephalon on ocular tension in rabbits and dogs.

Certain hypnotic drugs are assumed to have a more or less selective action on various regions of the brain. These drugs were used by other investigators to evaluate functional differences. Pick and his co-workers[2-5] determined that paraldehyde and chloral hydrate depress mostly the cerebral cortex; whereas, barbiturates act mainly upon hypothalamic centers. These observations inspired several investigations which in a sense tended to confirm Pick's findings. Barbiturates were found to be antagonistic to the analeptic effects of picrotoxin, ephedrine, and benzedrine which act on the brain stem.[6-8] Masserman's[9] work indicated that sodium amytal, a barbiturate, diminished or abolished in cats the sympathetic and emotional mimetic reactions of the hypothalamus to faradic stimulation. On the other hand, excitation of the cerebral cortex exerted no influence on the responses of the skeletal neuromuscular mechanism. Bender and O'Brien[10] found that barbiturates either decreased or altered nystagmus due to disease of the brain stem.

On the basis of these reports, paraldehyde and pentobarbital sodium (nembutal) were employed in the following experiments to differentiate the functional activity of the cerebral cortex from that of the diencephalon in relation to ocular tension. Additional data on the subject were supplied by Lowenstein and Schoenberg[11, 12] who demonstrated in their pupillographic studies the possible presence of a central sympathetic factor which is assumed to play a role in the production of primary simple glaucoma. The diencephalon includes the thalamus, the hypothalamus, and the hypophysis, the mammillary, and the pineal bodies, the trigonum habenulae, and the posterior commissure.

MATERIALS AND METHODS

Rabbits of 1 to 2 years of age and adult dogs were used. The ocular tension was determined tonometrically. In one phase of the investigation, paraldehyde was given orally (1.5 cc. per Kg. body weight) and diluted with water in proportion of 1 to 8. Pentobarbital sodium was injected intravenously (0.45 cc. per Kg. body weight). The concentration of both narcotics was sufficient to induce a moderately deep narcosis for a few hours. In another phase of the investigation, the effect of hypotonic solution was studied on narcotized animals. Immediately prior to injection of pentobarbital sodium or paraldehyde, 40 cc. of distilled water per Kg. of body weight was administered to the rabbits by mouth. The ocular tension was determined before and during narcosis at intervals of 2 to 20 minutes for two hours. The 5.5- and the 10-gm. weights were used. Care was exercised during narcosis to avoid extraneous pressure on rabbits' eyes. Narcosis was induced and the ocular tension was determined on 10 to 20 different occasions on each of the animals.

Eight normal rabbits and three dogs were employed in the experiments. In addition, three rabbits with abnormal changes were

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studied. Two of the abnormal animals had congenital hydrophthalmos. In the third animal, a secondary glaucoma was induced in the left eye with colloidal iron.

The eyes of the abnormal animals showed the following changes: In the experimentally induced glaucoma six weeks after introduction of colloidal iron, the cornea contained several superficial blood vessels, the iris was atrophied, there were several minor lens opacities, the left anterior chamber was deeper than the right, and there was a ring of white tissue, 1.5-mm. wide, inside the corneal limbus. Five months after induction of glaucoma, the left papilla was dark gray with a peripheral dark-red zone and the excavation was about two diopters.

In one of the animals with a congenital disorder, there was an increase in connective tissue between the eyeballs and the upper lids of both eyes. The corneas were cloudy and the corneal diameters were approximately 18 mm. Both anterior chambers were deep. The fundus of the right eye had a large papilla with slight peripapillary atrophy but with normal medullated fibers and without excavation. In the left eye, the papilla was larger, gray-red, with peripapillary atrophy and missing medullated fibers.

In the second rabbit both corneas were cloudy with a pannus glaucomatosus. The parenchyma showed Fuchs's "Aufhellungsstreifen." The corneal diameters were 17 mm. The irides in both eyes contained many large blood vessels. The right fundus showed a red reflex, the left was indistinct and peripapillary atrophy was present.

Results

The results of the experiments are outlined in the accompanying charts in which are shown the degree and the rate of change of tension. The curves represent average measurements of changes in tension as they were determined with the 5.5-gm. weight. Standard deviations for the above measurements were equal to ±2.5 mm. Hg; whereas, under normal conditions for a two-hour period, the deviations are ±1.5 mm. Results with the 10-gm. weight showed no variations indicating that, at least tonometrically, there was no difference in ocular rigidity in the normal and in the glaucomatous eyes (figs. 1, 2, and 3).

The ocular tension in normal and glaucomatous animals under paraldehyde showed no significant changes (fig. 1). Upon injection of pentobarbital sodium, the normal

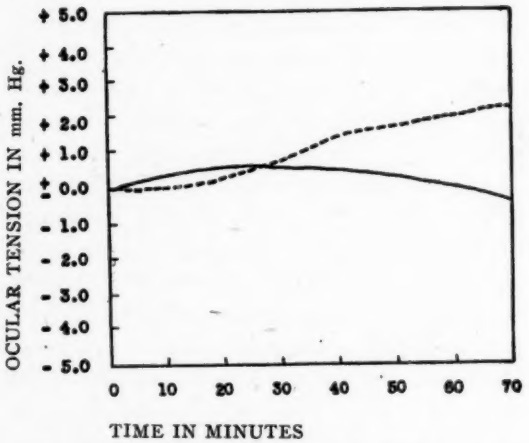

Fig. 1 (Schmerl and Steinberg). Ocular tension in normal rabbits (unbroken line represents 14 experiments) and glaucomatous animals (broken line—10 experiments) under the influence of paraldehyde. There are no significant changes in either group of animals.

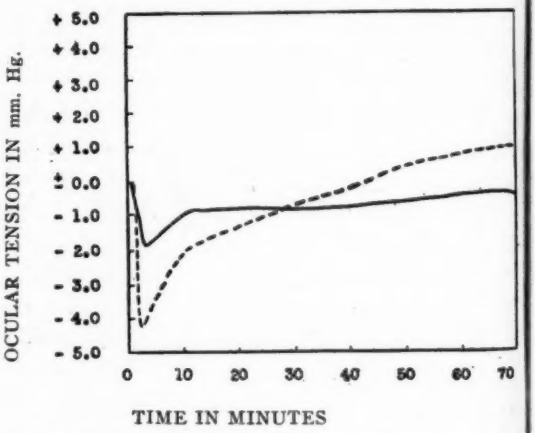

Fig. 2 (Schmerl and Steinberg). Ocular tension in normal (unbroken line—18 experiments) and glaucomatous animals (broken line—14 experiments) after injection of pentobarbital sodium. There is an immediate decrease in tension which shortly returns to normal.

and the glaucomatous animals showed an initial immediate decrease in tension which was followed by a return to normal (fig. 2).

Hypotonic solution (distilled water) was administered to normal and glaucomatous rabbits. The ocular tension showed a rapid and pronounced increase in the normal animals. The subsequent fall in tension occurred almost as rapidly. In the glaucomatous group of animals, the rise in tension was slower and less pronounced (fig. 3).

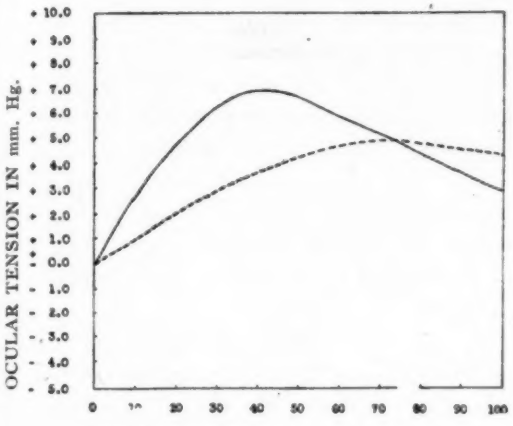

Fig. 3 (Schmerl and Steinberg). Distilled water was given orally to normal and glaucomatous rabbits and ocular tension determined in normal animals (unbroken line—16 experiments) and in glaucomatous animals (broken line—14 experiments). Note the rapidity of increase and decrease of ocular tension.

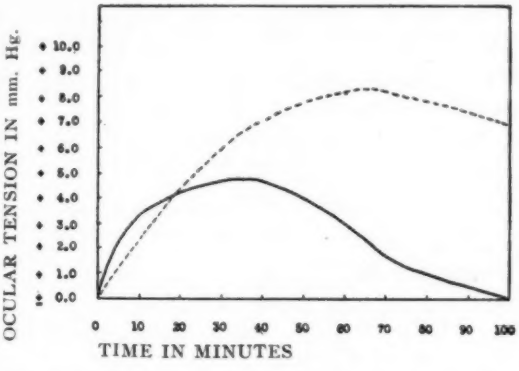

Fig. 4 (Schmerl and Steinberg). Ocular tension in normal (unbroken line—14 experiments) and glaucomatous animals (broken line—10 experiments) after introduction of distilled water and paraldehyde. The rise in ocular tension in the latter animals is rapid and pronounced. Compare with Figure 3. There is no significant change in the normal animals.

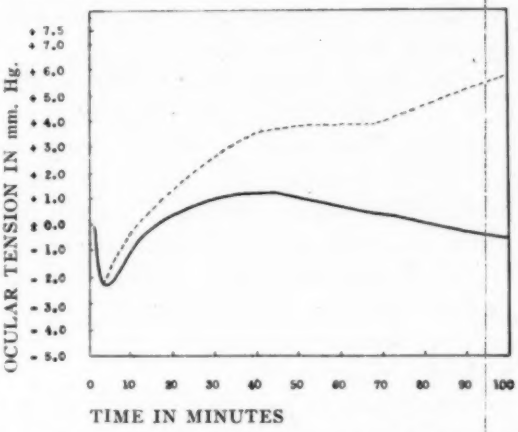

Fig. 5 (Schmerl and Steinberg). Ocular tension in normal (unbroken line—20 experiments) and in glaucomatous animals (broken line—14 experiments) with distilled water and pentobarbital sodium. The hypnotic inhibited the rise in tension in the normal and delayed it in the glaucomatous animals.

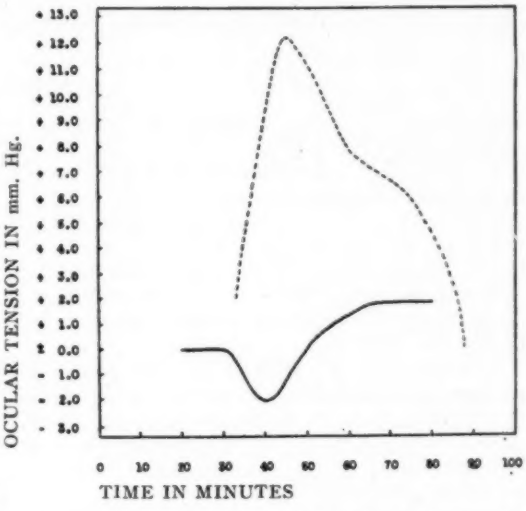

Fig. 6 (Schmerl and Steinberg). Ocular tension in a normal dog. Broken line represents tension following administration of paraldehyde and distilled water. Unbroken line represents tension following administration of pentobarbital sodium and distilled water.

Introduction of distilled water and paraldehyde into normal animals failed to change significantly the rise of the ocular tension

(fig. 4). On the other hand, in glaucomatous animals under similar conditions there occurred a considerably more rapid and pronounced rise in tension (fig. 4). The increase in tension was greater than obtained with hypotonic water alone (fig. 3).

Injection of pentobarbital sodium in animals to which distilled water had been administered showed no significant change in the ocular tension (fig. 5). Apparently pentobarbital sodium inhibited the rapid rise which occurred with distilled water alone (fig. 3). On the other hand, in glaucomatous animals after an initial delay, the tension became elevated to a degree equal to that without a hypnotic (fig. 3).

Introduction of pentobarbital sodium and of paraldehyde with distilled water in normal dogs paralleled the findings obtained in rabbits (fig. 6).

Summary and Conclusions

Paraldehyde, a hypnotic affecting primarily the cerebral cortex, produced no changes in the ocular tension of normal and glaucomatous animals. Paraldehyde also failed to inhibit the rise of tension in normal animals which were given distilled water. In glaucomatous rabbits under corresponding conditions, the rise in tension was more pronounced.

Pentobarbital sodium (nembutal), a hypnotic acting predominantly on the diencephalon, produced in normal and glaucomatous animals a slight immediate decrease in tension followed by a return to normal. There was also an inhibition of the usual rise in the ocular tension in normal animals which were given distilled water. The rise of tension in glaucomatous animals was delayed but not diminished.

It may be postulated, on the basis of these experiments performed under the conditions described, that the diencephalon contains a center or centers which exercise a regulating control of ocular tension. The experiments also suggest an instability of the diencephalic center or centers in glaucomatous animals.

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References

1. Schmerl, E., and Steinberg, B.: Determination of ocular tension and rigidity in rabbits. A. J. Ophth., **29**:1400-1404, 1946.

2. Molitor, H., and Pick, E.: Central regulation of water metabolism; central point of attack in checking diuresis by pituitary extracts. Arch. f. exper. Path. u. Pharmakol., **112**:113-121, 1926.

3. Pick, E.: Ueber Schlaf und Schlafmittel. Wien. klin. Wchnschr., (Sonderbeil 23). **40**:1-16, 1927.

4. Hoff, H., and Wermer, P.: Ueber psychische Beeinflussung der Tätigheit des Hypophysenhinterlappens. Arch. f. exper. Path. u. Pharmakol., **133**:97-102, 1928.

5. Feitelberg, S., Pick, E., and von Warsberg, A.: Ueber centrale Wärme-Erzeugung und Hemmung durch aromatische Amine und Acetylcholin. Arch. internat. de pharmacodyn. et de therap., **61**:447-474, 1939.

6. Linegar, C. R., Dille, J. M., and Koppanyi, T.: Antidotal action of picrotoxin in extreme cases of experimental barbiturate poisoning. Proc. Soc. Exper. Biol. & Med., **33**:396-399, 1935.

7. Maloney, A. H., Fitch, R. H., and Tatum, A. L.: Picrotoxin as antidote in acute poisoning by shorter acting barbiturates. J. Pharmacol. & Exper. Therap., **41**:465-482, 1931.

8. Rosenthal, F. E.: Hypnotics and blood regulating centers. J. Pharmacol. & Exper. Therap., **73**:446-454, 1941.

9. Masserman, J. H.: Effects of sodium amytal and other drugs on reactivity of hypothalamus of the cat. Arch. Neurol. & Psychiat., **37**:617-628, 1937.

10. Bender, M. B., and O'Brien, F. H.: The influence of barbiturate on various forms of nystagmus. A. J. Ophth., **29**:1541-1552, 1946.

11. Lowenstein, Otto, and Schoenberg, Mark J.: Nervous factor in the origin of simple glaucoma. Arch. of Ophth., **31**:384-391, 1944.

12. Lowenstein, Otto, and Schoenberg, Mark J.: Pupillary reactions of the seemingly unaffected eye in clinically unilateral simple glaucoma. Arch. of Ophth., **31**:392-398, 1944.

CYSTIC MALIGNANT MELANOMAS OF THE UVEAL TRACT*

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Cysts occurring in malignant melanomas of the uveal tract are chiefly of pathologic interest, but may, in themselves, present a clinical picture with a complicated diagnostic problem.

When cysts occur in ciliary body melanomas which extend behind the lens and in choroidal or iris melanomas which can be readily observed, there is no additional diagnostic problem. However, malignant melanomas projecting into the posterior chamber from the posterior surface of the iris, or from the ciliary body, may be difficult to differentiate from simple cysts. This diagnostic difficulty may be enhanced when malignant melanomas in this position become cystic. At least eight benign posterior-chamber cysts have been reported in the literature in which the eyes have been enucleated with the diagnosis of a malignant tumor.[1]

DIFFERENTIAL DIAGNOSIS

In the differential diagnosis, traumatic implantation cysts and retention or inflammatory cysts may be excluded if there is a negative history and no evidence of uveal inflammation. Developmental or spontaneous cysts of the iris stroma and pigmentary epithelium, particularly the latter, may be confused with malignant melanomas of the posterior chamber, especially since they may simulate a malignant melanoma closely, and occur in the older age groups.

Duke-Elder[2] lists the following diagnostic features of a cyst in the posterior chamber: multiplicity, tremulousness, mobility, presence of a notched margin, and, above all, translucency. However, the test of translucency by transillumination may be deceptive, since a cyst may have thick, pigmented walls and so appear solid. A tumor may undergo cystic changes with walls so thin the mass appears translucent. Thus while translucency may differentiate a cystic tumor from a solid tumor, it cannot differentiate between a benign cyst and a cystic malignant tumor. This is borne out by a patient seen by Hardy and reported by Doherty.[3] A 60-year-old white man had a black, spherical, pigmented spot on the pupillary border of the iris which was partially cystic by transillumination. Vision was normal. Because of its position, a complete removal of the mass by iridectomy was attempted. The tumor collapsed when grasped with forceps, and was excised through a wide keratome opening. A small pigment spot remained on the iris. Microscopic examination showed a malignant melanoma of the iris with cystic degeneration. The eye was later enucleated.

Diagnostic or exploratory puncture has been used to differentiate between a solid tumor and a cyst in the posterior chamber. This, however, is also unreliable, for, while an exploratory puncture may differentiate a cyst from a solid tumor, it cannot differentiate between a benign cyst and a cystic malignant tumor.

If a posterior-chamber tumor shows no evidence of cystic changes on transillumination or diagnostic puncture, it should be assumed to be solid and the eye enucleated. However, if either transillumination or diagnostic puncture indicates the possibility of cystic changes, it would appear the wiser course to remove the tumor by iridectomy, and await the pathologic report before deciding a more drastic surgical intervention.

REPORT OF A CASE

The complete clinical history and pathologic report of one case, which was studied in detail microscopically from serial sections, illustrates the type of lesions discussed.

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History

V. H., a 74-year-old white man, was first seen in December, 1945, by Dr. Eldred W. Kennedy of Rochester, New York.

Over a period of five months, the patient's vision had gradually failed in the left eye. During this time there had been frequent attacks of pain accompanied by redness and lacrimation. There were no previous ocular symptoms and no history of trauma. There was a family history of malignant disease. The past history was not significant, and the physical examination was essentially normal for a patient of his age. Routine laboratory studies were noncontributory.

Eye examination

The right eye was normal, with corrected vision of 20/20. The intraocular pressure was 18 mm. Hg (Schiøtz).

The left eye had a visual acuity of 20/400, unimproved with lenses. The eye was entirely white and the cornea clear. There were no keratic precipitates, and the aqueous ray was negative. When observed obliquely with direct illumination, a small black tumor could be seen in the lower nasal quadrant which filled the posterior chamber between the iris and lens. The anterior chamber was of normal depth except at the lower nasal quadrant where the iris bulged forward at its root to touch the cornea between the 7- and 8-o'clock positions. The iris in this region appeared thinned out with separation of the stromal fibers and the iris crypts appeared very dark. A small, black-pigmented, crescent-shaped area was present in the iris stroma near, but did not extend to, the root of the iris above the tumor. The pupil was equal in size to that of the right eye, but was slightly elongated or pear-shaped, with the apex directed downward and nasally. This abnormal shape was due to stretching of the iris by the underlying tumor. The pupil dilated slightly with mydriatics, but not at the site of the tumor. The tumor was well outlined by transillumination and appeared solid. The lens was cataractous and only vague fundus details were seen. Intraocular pressure measured 23 mm. Hg (Schiøz), and the field was full by confrontation.

The mass was thought to be a tumor of the posterior chamber, probably a malignant melanoma, arising from the iris or ciliary body. While a posterior chamber cyst was considered, there was no history of trauma, and the mass appeared solid to transillumination. The patient was observed for a period of three weeks, during which time other consultants concurred in the diagnosis. Enucleation was advised and performed during December, 1945, under cyclopropane anesthesia. The patient was in good health, and there was no local recurrence 14 months later.

Pathologic examination

Macroscopic. The globe was fixed in 10-percent formalin and opened in a vertical plane. There were no lesions other than the tumor which was approximately 2 by 2 by 1 mm. It appeared as a pedunculated mass suspended from the crown of the ciliary body among the ciliary processes, and was adherent to the posterior surface of the iris.

Microscopic. Serial sections were cut from paraffin blocks and stained with hematoxylin and eosin stain, Verhoeff-van Gieson stain, Prussian-blue stain, and the Wilder reticulum stain.

Aside from senile changes the sections were normal except for the lesion to be described. On one side a tumor mass occupied the anterior portion of the ciliary body and replaced the ciliary muscle in that region (figs. 1 and 2). A large oval cyst arose from the anterior portion of the tumor and extended into one of the ciliary processes. The cyst wall was adherent to the peripheral three fourths of the iris and was composed of several layers of tumor cells covered with pigmented and nonpigmented epithelium. The cyst was lined by a flattened layer of tumor cells, and contained a large amount of serous exudate, cellular debris, and a few

pigment-laden macrophages. A bridging layer of tumor cells divided the cyst into a large and small loculus. The cyst bulged the iris forward to form a peripheral anterior synechia. Many pigment-laden macrophages were present in the iris stroma near its root. Pigmented tumor cells invaded the iris root and the trabeculum to the canal of Schlemm (fig. 3). The underlying cornea and sclera were not invaded. The tumor was made up of whorls of irregularly arranged, closely packed, spindle-shaped cells. The nuclei were large, oval, and deeply staining, and contained a delicate reticulum. Nucleoli were present in a few of the nuclei. There were

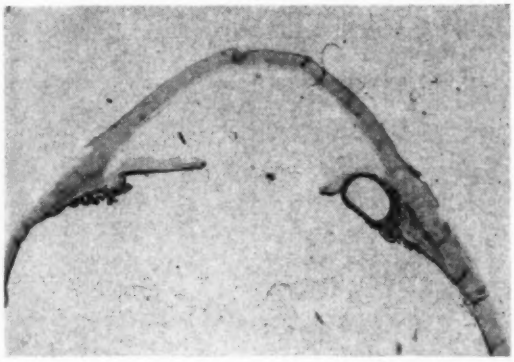

Fig. 1 (Kennedy). Posterior-chamber cystic malignant melanoma bulging iris forward to close angle. (E. W. Kennedy's case. Hematoxylin-eosin stain. Magnification, ×4.)

irregular areas of moderate pigmentation throughout the tumor, with both intra- and extracellular melanin granules. With the Wilder stain the reticulum fiber content of the tumor was marked, being more than 50 percent. The Prussian-blue iron stain was negative.

The pathologic diagnosis was cystic malignant melanoma of the ciliary body, spindle-cell type, predominantly subtype A.

Report of similar cases

There are three specimens in the Army Institute of Pathology, all of which are quite similar to the case here reported. These cases are as follows:

Case 1. Accession Number 71451 (contributed by Dr. L. Weston Oaks of Provo, Utah). Cystic malignant melanoma of the ciliary body. The patient was a 36-year-old trained nurse who is living and well six years after enucleation. The growth had been noticed four months before operation. A black mass behind the iris pushed the iris forward in the lower temporal quadrant. The iris stroma was attenuated, and the pigmentation normal. The mass appeared solid to transillumination. Corrected vision was 20/22 in the right eye, and 20/15 in the left eye. Intraocular pressure measured 13 mm. Hg

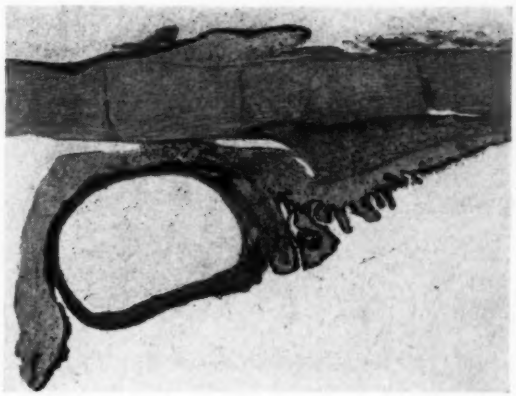

Fig. 2 (Kennedy). Higher power of Figure 1, showing extension of cystic melanoma into a ciliary process. Cyst is turned on pedicle so that section is to the side of tumor mass in ciliary body. (Hematoxylin-eosin stain. Magnification, ×10.)

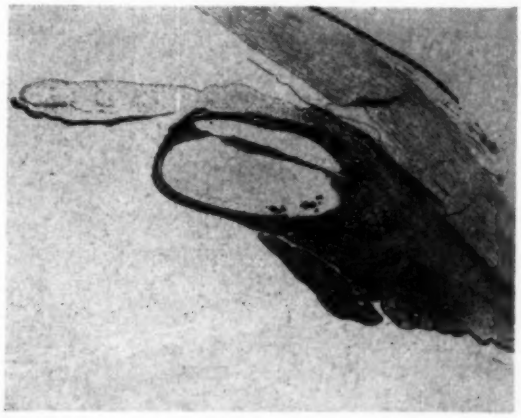

Fig. 3 (Kennedy). The same case as in Figure 2. Bilocular cyst arising from malignant melanoma of ciliary body, showing invasion of filtration angle to canal of Schlemm. (Hematoxylin-eosin stain. Magnification, ×10.)

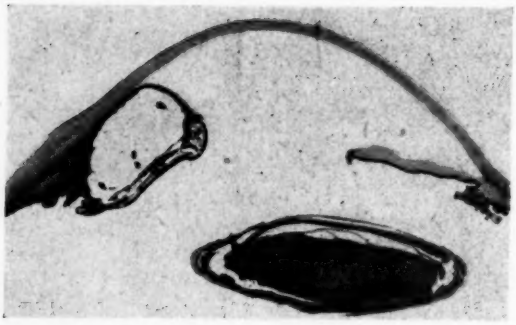

Fig. 4 (Kennedy). Posterior-chamber cystic malignant melanoma of ciliary body bulging iris forward to close angle. (Oaks's case. Hematoxylin-eosin stain. Magnification, ×4.)

(Schiøtz) in each eye, and the fundi were negative. The pathologic picture (figs. 4 and 5) was strikingly similar to the first case. The cyst was considerably larger and the adjacent wall was made up of many minute cystic spaces. The strands and islands of tumor cells within the cyst are evidence of walls of adjacent cystic areas which have broken down to coalesce.

Case 2. Accession Number 82272 (contributed by Dr. William L. Benedict of Rochester, Minnesota). Cystic malignant melanoma of the iris. The tumor involved the iris on one side and completely replaced the normal iris stroma, causing the iris to be several times its normal thickness. Bulging forward from the anterior surface of the iris into the anterior chamber, was a large cystic space, lined by tumor cells. The cell structure was made up of irregular whorls of spindle-shaped cells (fig. 6).

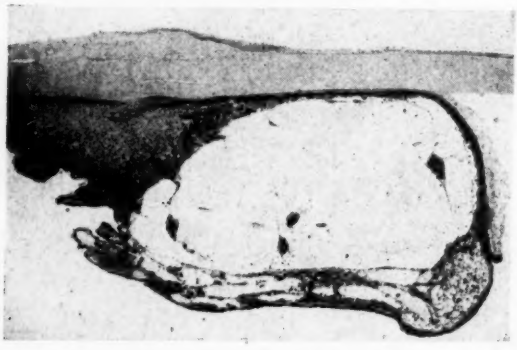

Fig. 5 (Kennedy). Higher power of Figure 4. Iris is pushed to back of cornea by cyst. Strands and islands of tumor cells within cyst are evidence of coalescence of adjacent cystic spaces. (Hematoxylin-eosin stain. Magnification ×10.)

Case 3. Accession Number 76213 (contributed by Dr. Charles C. Grace of St. Augustine, Florida). Cystic malignant melanoma of the ciliary body. The tumor extended forward into the root of the iris on one side. The anterior-chamber angle was closed off by the tumor. Many cystic spaces were present in the body of the tumor (fig. 7).

Typical cystic areas in choroidal malignant melanomas are shown in Figures 8, 9, and 10. These cases illustrate cystic malignant melanomas in various sites in the uveal tract.

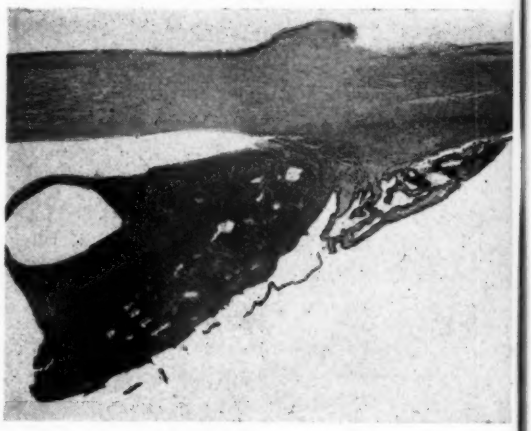

Fig. 6 (Kennedy). Cystic malignant melanoma of the iris. (Benedict's case. Hematoxylin-eosin stain. Magnification, ×10.)

Comment

Cystic areas in malignant melanomas are a degenerative change and a manifestation of tumor necrosis. Most malignant melanomas show minute focal points of necrosis, which are manifested by areas of irregularly staining cells showing pyknosis and karyolysis. The vessels of the growing tumor are large and there are no capillaries. As a result of this inadequate blood supply, there is a deficiency of nutrition. The result is death of the cells which are too far from the vessels to receive adequate nourishment. The

blood supply may also be limited by hyaline degeneration of the vessels, or by the actual compression of the vessel lumen by the growth of the tumor. The degenerated material in the focal areas of necrosis may become absorbed, forming minute cystic spaces, as shown in Figures 9 and 10.

The growth or development of the minute cysts may progress in many ways. A cyst may develop from a single area or from the coalescence of multiple cystic areas with further growth. Such cytotoxins may diffuse through the surrounding tumor tissue and may possibly have a histaminelike effect on the blood vessels in the tumor, causing an undue permeability and injury of the vessel walls which results in an extravasation of fluids into the cyst. A positive osmotic pressure in the cyst might increase its fluid content. The fact that these cysts grow by increase in their fluid content is suggested by the globular or spherical shape which they assume. This is apparent in sections showing larger cysts. In sections with small cysts, the spaces are usually more irregular in shape, indicating an earlier stage in development before growth has progressed.

Hemorrhage is another possible etiologic cause of cysts in malignant melanomas. Small hemorrhages in the tumor substance occur frequently in melanomas. Liquefaction of such a hemorrhagic area might leave a degenerative cystic space. However, the occurrence of red blood cells is very rarely seen in the cystic spaces, or the adjacent tumor tissue. In the first case, there was no evidence of old blood pigment in the tumor or cyst with the Prussian-blue stain.

Malignant melanomas are sometimes extremely vascular. Large blood-filled spaces may have only an endothelial wall between the tumor cells and blood spaces, and are sometimes lined with tumor cells in direct contact with the blood. These large blood spaces present a "pseudocystic" appearance which may be confused with true cystic spaces. An example of this is shown in Figure 11.

True areas of cystic degeneration may be

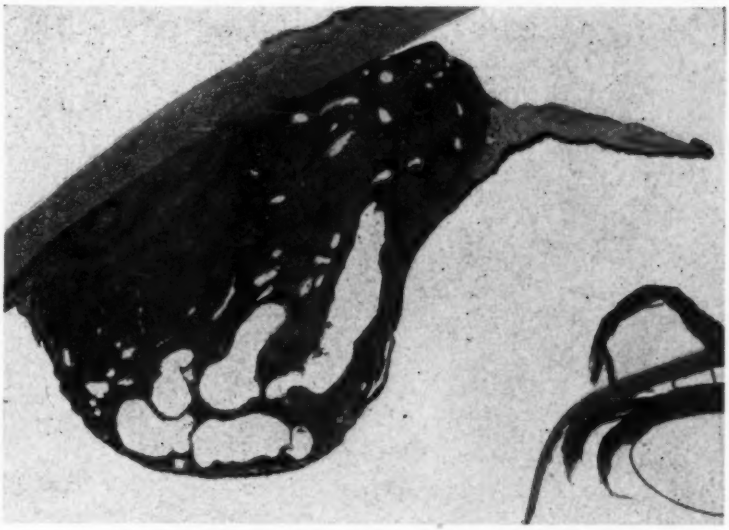

Fig. 7 (Kennedy). Multiple cystic malignant melanoma of the ciliary body invading the iris and obstructing the filtration angle. (Grace's case. Hematoxylin-eosin stain. Magnification, ×12.)

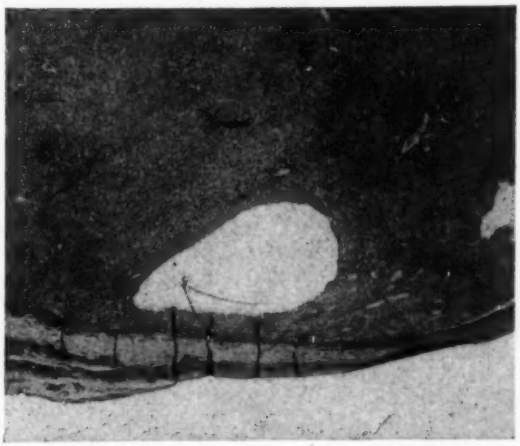

Fig. 8 (Kennedy). Typical cystic choroidal malignant melanoma. (Wilmer Pathology No. 7984. Hematoxylin-eosin stain. Magnification, ×10.)

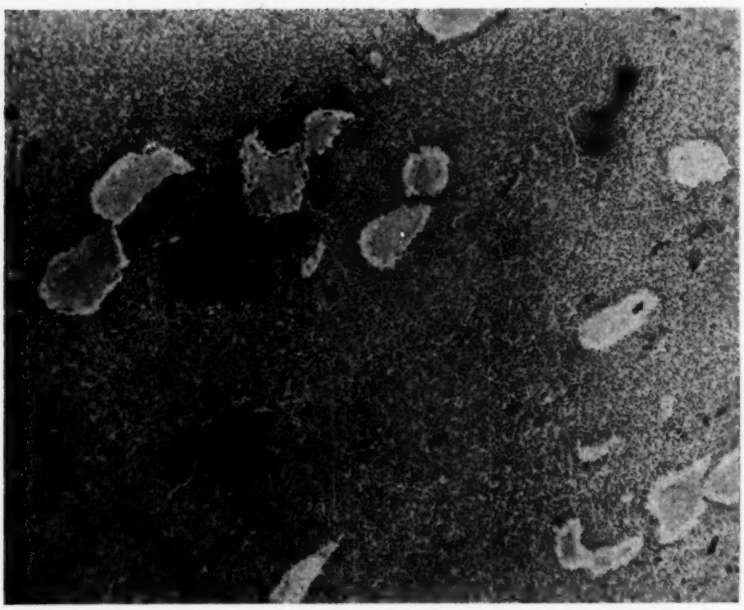

Fig. 9 (Kennedy). Focal areas of necrosis showing minute cysts. (Wilmer Pathology No. 3772. Hematoxylin-eosin stain. Magnification, ×40.)

differentiated from such blood spaces in malignant melanomas in many ways. The true cysts are usually much less numerous than the many vascular blood spaces. Red blood cells are very rarely seen in, or adjacent to, the true degenerative cysts, in contrast to the blood spaces which are usually filled. The cystic areas are usually lined by irregular cells projecting into the lumen, and many of the adjacent cells show necrosis. In contrast, the blood spaces are lined with endothelial cells, or a more regular wall of tumor cells. The cysts may show strands of tumor cells supporting islands of tumor cells as evidence of walls of adjacent cystic areas which have broken down to coalesce (fig. 5).

The Wilder stain[4] for reticulum fiber content and distribution may be used as a further point of differentiation between cystic and blood spaces. Dr. Grace's case (fig. 7), showing degenerate cystic spaces, is shown in greater magnification in Figures 12A and 12B. Figures 13A and 13B are sections of a typical vascular choroidal malignant melanoma of the same magnification. Figures 12A and 13A are stained with hematoxylin and eosin, and Figures 12B and 13B with the Wilder reticulum stain. The true cysts and the blood spaces stained with hematoxylin and eosin show a somewhat similar pic-

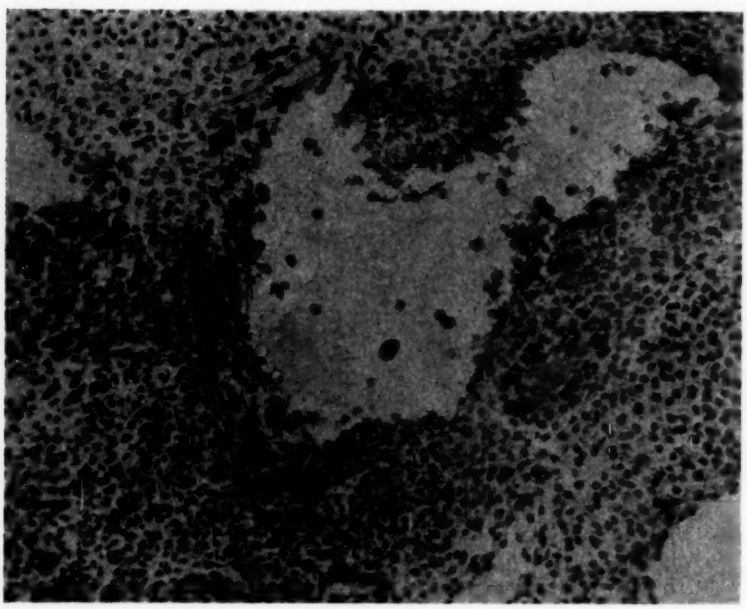

Fig. 10. (Kennedy). Higher power of Figure 9, showing irregular edges of cyst bordered by poorly staining cells. (Hematoxylin-eosin stain. Magnification, ×140.)

Fig. 11 (Kennedy). Vascular malignant melanoma of choroid giving a "pseudocystic" appearance. Blood spaces are numerous and all contain red-blood cells. (Wilmer Pathology No. 8613. Hematoxylin-eosin stain. Magnification, ×12.)

ture, but are easily differentiated with the Wilder reticulum stain. With the Wilder stain, the true cystic spaces show irregular edges relatively free from reticulum fibers, and the reticulum fibers may simulate an actual compression effect in the solid tumor away from the cysts. The blood spaces show more regular edges, with the reticulum fiber content most apparent, lining the walls and closely surrounding the blood spaces. The reticulum content around the blood spaces and vessels is also shown in relation to the blood vessels above the cystic spaces in Figure 12B.

To determine the frequency of cystic changes in malignant melanomas, a survey was made of all the routine sections of eyes containing malignant melanomas in the pathology department of the Wilmer Institute. In addition, the material from the Army Institute of Pathology was made available so that an additional group was studied. Thus a total of 440 routine sections of eyes containing malignant melanomas were ex-

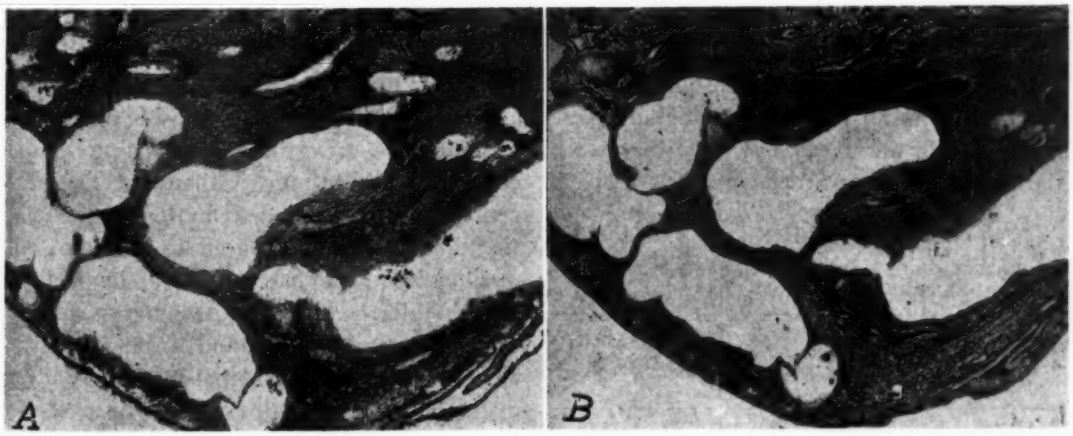

Fig. 12 (Kennedy). A higher-power reproduction of Figure 7, showing degenerate cystic spaces. (Magnification, ×30.) (A) Hematoxylin-eosin stain. (B) Wilder reticulum stain. The irregular walls of the cyst are relatively free of reticulum fibers. Fibers in the solid portion of tumor give the appearance of compression. Blood vessels in the upper part of figure are clearly outlined with marked surrounding of the reticulum-fiber content in contrast to cystic spaces.

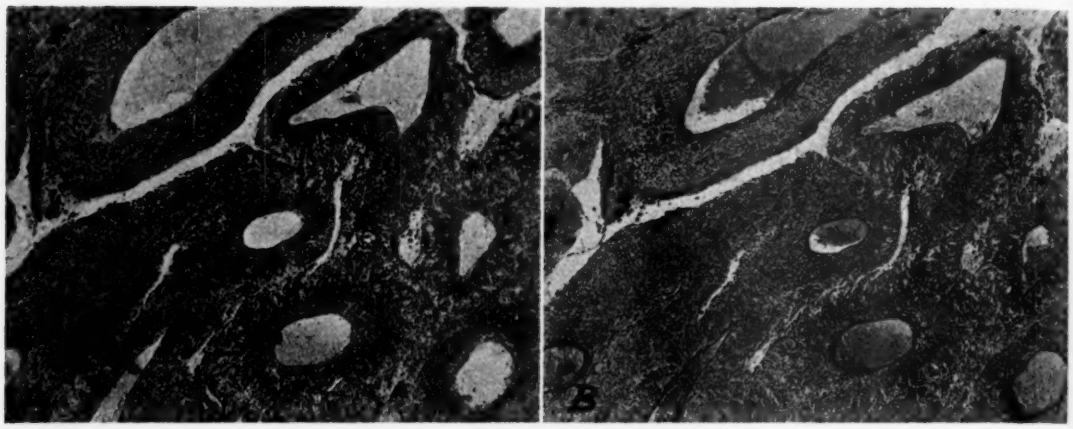

Fig. 13 (Kennedy). Blood spaces of typical vascular choroidal malignant melanoma giving a "pseudocystic" appearance. (Wilmer Pathology No. 6369. Magnification, ×30.) (A) Hematoxylin-eosin stain. (B) Wilder reticulum stain. Blood-space walls are more regular, and there is moderate adjacent reticulum-fiber content clearly outlining blood spaces.

amined (table 1). Of these, 148 sections were from the iris and ciliary body or both, and 292 were from the choroid. Thirty-seven of the 440 sections, or 8.4 percent contained cystic areas. Such a figure, 8.4 percent, can only be approximate, since the change from small focal areas of necrosis to the large, well-developed cystic formations is gradual and indefinite. Whether such changes are sufficient to be considered actually cystic depends upon the judgment of the observer. The occurrence of cystic changes was approximately equal in the iris and ciliary body (8.8 percent) and choroid (8.2 percent), so that there was no predilection for any particular site in the uvea. However, the cystic changes in malignant melanomas of the iris and ciliary body usually were larger in proportion to the size of the tumor, and were more apparent than the change in choroidal melanomas. The cystic changes in the malignant melanomas of the choroid were most apparent in those tumors which bulged freely into the vitreous cavity, or particularly those breaking through the lamina vitrea with the typical mushroom appearance. The decreased blood supply through the neck of these mushroom-shaped tumors and their uninhibited growth once they have broken through the lamina vitrea both, no doubt, aid cystic development.

TABLE 1

PERCENTAGE OF MALIGNANT-MELANOMA SPECIMENS SHOWING CYSTIC CHANGES

	Iris Ciliary Body	Choroid	Total
Total examined	148	292	440
Number showing cystic changes	13	24	37
Percentage showing cystic changes	8.8%	8.2%	8.4%

As shown in Table 2, the cystic malignant melanomas were grouped according to the cellular classification of Callender.[5] The percentages of cell-type distribution of the cystic tumors were compared to those of all malignant melanomas, as found by Callender, Wilder, and Ash[6] in a series of 500 specimens, and were found to be about the same. There was no statistically significant difference in the small series of 37 cases to indicate a preference for any cell type. No cystic malignant melanomas were placed in the necrotic group of Callender, Wilder, and Ash as being too necrotic for cellular classification. There were too few cases with

TABLE 2

CLASSIFICATION BY CELL TYPE OF CYSTIC MALIGNANT MELANOMAS: COMPARISON WITH NORMAL CELL-TYPE DISTRIBUTION

		Cystic Malignant Melanomas				All Malignant Melanomas % of Total
		Iris Ciliary Body	Choroid	Total	% of Total	
CELL TYPE	Spindle	7	9	16	43.2%	30.4%
	Fascicular	1	3	4	10.8	2.6
	Necrotic	0	0	0	0.0	9.0
	Mixed	4	11	15	40.6	55.2
	Epithelioid	1	1	2	5.4	2.8
	Total	13	24	37	100%	100%

a long enough follow-up to indicate whether there was any difference in prognosis between the cystic and noncystic groups, although with the facts available there appeared to be no difference.

CONCLUSIONS

Cystic malignant melanomas may present a diagnostic problem when they occur in the posterior chamber where their differential diagnosis from a benign uveal cyst is difficult.

The determination of translucency and the diagnostic puncture may differentiate a solid and cystic posterior-chamber mass, but cannot differentiate a benign and malignant cystic mass. Thus, they are unreliable diagnostic procedures.

When accessible, iridectomy and microscopic examination should be used to diagnose such lesions when their diagnosis is in doubt.

Large cystic spaces in malignant melanomas arise from the growth of small focal areas of tumor necrosis which are the result of inadequate nutrition.

The cystic manifestation is present in about 8 percent of all malignant melanomas of the uvea, has no predilection for the site in the uvea or the cell type, and has no apparent affect on the prognosis of malignant melanomas.

I wish to thank Mrs. H. C. Wilder for her help in making available for study the material from the Army Institute of Pathology.

Acknowledgement is made to my father, Dr. E. W. Kennedy, and to Dr. L. W. Oaks, Dr. W. L. Benedict, and Dr. C. C. Grace for permission to report their cases.

REFERENCES

1. Duke-Elder, W. S.: Textbook of Ophthalmology. St. Louis, C. V. Mosby Co., 1940, p. 2444.
2. Ibid.: P. 2444.
3. Doherty, W. B.: Melanosarcoma of the iris. A. J. Ophth., 22:239, 1939.
4. Wilder, H. C.: An improved technique for silver impregnation of reticulum fibers. A. J. Path., 11:817, 1935.
5. Callender, G. R.: Malignant melanotic tumors of the eye: A study of histologic types in 111 cases. Trans. Amer. Acad. Ophth. and Otol., 36:131,1931.
6. Callender, G. R., Wilder, H. C., and Ash, J. E.: Five hundred malignant melanomas of the choroid and ciliary body followed five years or longer. Trans. Amer. Acad. Ophth. and Otol., 46:223, 1942.

PERIPHLEBITIS RETINALIS ASSOCIATED WITH INTRACRANIAL MANIFESTATIONS

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It has been my observation that symptoms of intracranial disease occur in patients with severe periphlebitis of the retina. Three cases are presented in which severe periphlebitis of the retina was associated with severe headaches and other signs of possible intracranial disease. A fourth case is presented, but other diseases were present in this case, which made it difficult to determine the etiology of headaches and coma. The first three patients were observed in the Army, the fourth at the Scott and White Clinic.

The ophthalmoscopic appearance of severe periphlebitis of the retina is spectacular. The veins are irregularly dilated and tortuous; the dilatation is usually marked; and sheathing of the veins may be very prominent. Often, portions of the vessels are obscured by retinal edema. New blood-vessel formation, "rete mirabile," is common. Hemorrhages and exudates are numerous, and usually fairly large and widely scattered. Large, vitreous hemorrhages are not of unusual occurrence. Glaucoma may terminate any possible useful function of the eye. It seems likely that the retinal arterioles are also, to some extent, involved, but the inflammation of the veins overshadows it.

Clinically, the term "periphlebitis" does not seem to describe the condition accurately and completely. With the markedly dilated veins and the many hemorrhages and exudates, thrombophlebitis would seem a more descriptive word. Of course, the lumens of the veins can be completely obliterated by proliferation without thrombosis.

Duke-Elder[1] states that the vast majority of the chronic cases of perivasculitis of the retina in young individuals are due to tubercle. Verhoeff and Simpson[2] found a tubercle obstructing the lumen of the central retinal vein on microscopic examination of an eye removed because of hemorrhagic glaucoma. Because the other eye had previously been affected with periphlebitis retinalis, the authors felt this gave strong support to the view that periphlebitis retinalis is tuberculous in nature.

CASE REPORTS

CASE 1

History. A 29-year-old, white officer developed severe occipital headaches and a low-grade fever on September 8, 1942. This was followed on September 15, 1942, by nausea and vomiting. On September 20, 1942, diplopia and photophobia developed and he noticed for the first time that his vision seemed diminished.

Examination on October 29, 1942, showed vision to be 20/20 and J1, both eyes. There were marked eyeground changes in both eyes, papilledema was present, the veins were irregularly dilated and tortuous, there was marked sheathing of the veins, and many hemorrhages and exudates were present. There was an intention tremor.

Labortory tests. Skin reaction to 0.01 mg. and 0.1 mg. of old tuberculin was negative. A spinal tap on December 8, 1942, showed pressure of 210 mm. of water, 150 lymphocytes were present, sugar was 78 mg. percent, total protein was 165 mg. Blood N.P.N., urea N. and creatinine were within normal limits. Widal, Kahn, blood cultures, stool examinations, sputum test for tuberculosis, agglutination for undulant fever, and smears for malaria were negative.

An X-ray film of the chest revealed Ghon's tubercle of the right lower lobe and calcification of the tracheobronchial nodes. A ventriculogram on January 24, 1943, showed no evidence of a brain-displacing mass.

Course. The patient remained relatively asymptomatic from January, 1943, to April, 1943. An afternoon temperature of about 100°F. was constant. On April 28, 1943,

the patient complained of dimness of vision. Thickness of speech, deviation of the tongue to the right, and definite weakness of the left facial muscles were noted at that time. The papilledema increased, although vision remained 20/20.

Diagnosis. A diagnosis of pneumonia, right base, was made on June 19, 1943, and the patient was given sulfadiazine. He complained of pain over the left inner thigh on June 23, 1943. Thickening of the great saphenous vein seemed to be present on palpation. On July 8, 1943, it was noted that the patient had lost ability to speak and to swallow, and he had to be fed with a tube. A complete right hemiplegia was present. A large amount of pleural fluid was aspirated on the right on July 15, July 24, and July 27, 1943. The report of a ventriculogram on August 20, 1943, was: "Diffuse, cortical atrophy of right frontal and anterior parietal areas; left ventricle enlarged; no evidences of space-consuming lesion."

By November 10, 1943, there was some return of muscle function on the right, and the patient was able to take liquids by himself. By December 10, 1943, there was a continued improvement in the general condition and the motion of the extremities continued to improve. The fundi had almost completely cleared. All the hemorrhages and exudates had disappeared and the vessels had returned to normal size, but some sheathing of the veins was still evident.

Case 2

History. A young enlisted man, stationed outside continental United States, had been in good health until early July, 1943, at which time he complained of severe, left frontal headaches. Blurring of vision of the left eye was noticed on July 27, 1943. The blood pressure was found to be elevated at this time. The headaches continued with varying degrees of severity. An encephalogram performed on December 10, 1943, showed a possible lesion of the left frontal lobe. He was transferred to Lawson General Hospital on December 15, 1943, with the diagnoses of: (1) Tumor, type undetermined, right frontal lobe of the brain. (2) Hemorrhage, subretinal. (3) Arterial hypertension.

Examination revealed blood pressure to be 168/104 mm. Hg. Vision in the right eye was 6/200, and in the left, hand movements at one foot. There was complete detachment of the left retina. In the right eye there were the typical findings of a severe periphlebitis; that is, extreme tortuosities and dilatation of veins with sheathing, edema of the disc, new blood-vessel formation at the disc, and numerous hemorrhages and exudates.

Laboratory tests. All laboratory work, including four spinal-fluid examinations, Wassermann, blood counts, and urine analysis, indicated conditions within normal limits. The X-ray picture of the chest was reported as negative. A ventriculogram showed the left ventricle to be slightly larger than the right, but it was the opinion of the neurosurgeon that the patient did not have a space-taking mass.

The patient was transferred, so the final outcome was not known.

Case 3

History. A 25-year-old member of the W.A.C. first complained of blurred vision in the right eye about September 15, 1943.

Examination. When first examined on September 30, 1943, the vision in the right eye was 20/50, and in the left, 20/20. Several areas of pigmentation were present in the right fundus, suggestive of old, healed choroiditis. Several areas of recent hemorrhage were present. She complained of severe, continuous headaches, beginning October 12, 1943. These headaches were not relieved by medication. On October 21, 1943, there were fresh hemorrhages noted along the course of the veins of the right eye. A diagnosis of "periphlebitis of vessels of right retina" was made.

Course. The hemorrhages in this eye increased until December 8, 1943, when the vision was reduced to light perception. Intraocular pressure remained normal. The pa-

tient continued to complain of severe headaches. All laboratory work was negative. Neurologic examination, including a ventriculogram, revealed no intracranial lesion.

The patient was transferred.

Case 4

History. A 28-year-old, white man was first seen in the clinic on January 12, 1947. He had been a known diabetic since the age of 15 years but, after he left school, very little attention had been given to dietary control.

The patient stated that he became suddenly blind in the left eye on July 4, 1946, following a blow on the face. Severe, recurrent headaches developed about this time, although there was a history of frequent, frontal headaches since 1935. In August, 1946, the patient developed severe headache, nausea, dysarthria, muscular unsteadiness, violence, and unconsciousness. Similar attacks developed in October, November, and December, 1946. The periods of unconsciousness lasted 2 or 3 days. The patient stated that he had been taking from 24 to 60 units of regular insulin a day and his urine was sugar free. He was told, during one of these hospitalizations, that his sputum was positive for M. tuberculosis. An encephalogram was advised because an intracranial lesion was suspected.

Examination. An eye examination upon admission revealed vision to be: R.E., 20/200; L.E., hand movements at one foot. In the right eye the typical findings of severe periphlebitis were present. In addition, small, "hard" exudates and small hemorrhages were seen around the macular region. There was no light reflex from the left eye.

Diagnosis. The following diagnoses were made by Dr. Ralph G. Greenlee of the medical department: (1) Diabetes mellitus. (2) Glomerulonephritis, chronic, with uremia. (3) Pulmonary tuberculosis. (4) Arterial hypertension. (5) Neuritis, peripheral.

Course. After discharge from the hospital, a competent internist to whom he was referred reported that he continued to complain of severe headaches when his diabetes was known to be under control.

Comments

The simultaneous occurrence of intracranial lesions and periphlebitis of the retinas in Case 1 does not prove a common etiology, or even a relationship. The occurrence of severe, continuous headaches in Case 2 and Case 3 does not prove intracranial involvement. Symptoms were of sufficient severity, however, that ventriculograms were believed to be indicated. In Case 4, the severe headaches and coma may have been due to hypoglycemia; however, severe headaches were present at a later date when diabetes was known to be under control. With inflammation as widespread and as severe as it is in many cases of periphlebitis retinalis, it would seem logical that the process would not end abruptly at the lamina cribrosa or optic foramina.

Summary

1. Four cases of periphlebitis retinalis, associated with severe headaches and other signs of possible intracranial disease, have been presented.

2. The cases are not presented as proof that intracranial pathologic conditions are a frequent occurrence in periphlebitis retinalis, because the series is too small. The simultaneous occurrence of periphlebitis retinalis and symptoms of intracranial disease is suggestive of a common etiology.

Scott and White Clinic.

References

1. Duke-Elder: Textbook of Ophthalmology. St. Louis, C. V. Mosby Co., 1941, v. 3, p. 2639.
2. Verhoeff, F. H., and Simpson, Victor G.: Tubercle within central retinal vein. Trans. Sect. Ophth. A. M. A., pp. 121-132, 1940.

HISTOLOGIC STUDY OF EXPERIMENTAL CORNEAL TRANSPLANTATION*

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INTRODUCTION

Although corneal transplantation has been studied since 1824, the biologic process that takes place between host and graft remains as yet incompletely understood. There have been two leading points of view, one seemingly quite different from the other. Thus Fuchs,[22] Elschnig,[14] Castroviejo,[8,9] Ascher,[2] and others believed that in corneal transplantation there is true healing, with preservation of the vitality of the graft within the tissues of the host's cornea; Salzer,[30-35] Ribbert,[29] and others, however, claimed that there is an active regenerative process on the part of the host's cornea, which eventually totally replaces the transplant. A less definite point of view seems to have been taken by others like Loehlein,[28] and Filatov,[19] although Loehlein seems to be more in favor of the regeneration theory in his later publications.

It is not our aim in this present article to go too deeply into this theoretical discussion, but chiefly to present our own histologic experimental data. We hope, however, that this data may contribute to a better understanding of the extremely interesting biologic process taking place between the host's cornea and the transplant.

HISTORICAL REVIEW

Our review of the literature on this subject is restricted to those publications on corneal transplantation that contain histologic studies, without considering the development of the different operative techniques.

In general, these studies have been done either on human eyes obtained some time after corneal transplantation, or from animal eyes which have been operated upon and subsequently enucleated for experimental purposes. The clinical material for the first type of examination has always been meager, and according to a report of Filatov,[19] up to 1935, not more than 3 or 4 clinical cases have been reported in the literature.

The first of these cases, reported by Fuchs[22] in 1901, was obtained from a 20-year-old girl with bilateral interstitial keratitis on whom a keratoplasty was performed with a donor cornea taken from a human eye enucleated because of iridocyclitis. Two-and-one-half years later, the graft turned opaque so that a second keratoplasty was undertaken; the opacified part of the cornea, removed in full thickness, was studied microscopically by Fuchs. Thus, he found that the graft healed well at the beginning but that opacification and vascularization took place later. The most anterior portion of the graft tissue remained largely unchanged except that the stroma lamellae were more wavy in appearance, with a few nuclei of wandering cells beside the fixed cells. The posterior portion of the graft presented considerable changes. Descemet's membrane appeared folded and shortened, and between the corneal lamellae there were numerous nuclei and blood vessels. The posterior surface of Descemet's membrane was covered by a layer of thick fibrous tissue, which Fuchs believed to be thick scar formation. Descemet's membrane of the host cornea, surrounding the graft, extended out behind the graft on one side, but its posterior surface was also covered by the same fibrous tissue. Fuchs drew the conclusion that the transplant preserved most of its elements even after a period of 2½ years, and no sign of replacement of the graft by the sur-

* This study was carried on under the auspices of the Ayer Foundation and the Eye-Bank for Sight Restoration, Inc.

† Visiting research fellow.

rounding corneal tissue was demonstrable.

The 2nd and 3rd clinical cases examined histologically were reported by Ascher[2] in 1919. Besides material which he obtained from the removal of opaque grafts taken out in the course of a secondary transplantation, Ascher was able to report on two clinical cases with detailed histologic studies.

His first eye was from a 15-year-old girl treated for corneal fistula by partial penetrating keratoplasty. The eye was enucleated six weeks after operation because of the danger of sympathetic ophthalmia. The second case was a trachomatous corneal leukoma on which a keratoplasty had been performed. The patient died two months after the operation.

After describing the histologic findings in both instances in great detail, Ascher concluded that up to the time of enucleation in each case there was no sign of structural changes in the transplanted tissue or of its replacement by the surrounding cornea. Not only did Bowman's membrane and Descemet's membrane retain their identity, but even the epithelium at the junction did not show any definite sign of regeneration.

Sommer,[38] in 1925, enucleated an eye because of glaucoma, 15 months after a partial penetrating keratoplasty, and a histologic study of this eye was made. He found that the original tissue of the graft was essentially maintained and no replacement could have taken place.

Another case was reported by Frieberg[21] in 1927. It was a case of keratitis scrofulosa, treated by repeated keratoplastic operations. The graft was taken out 21 months after the first operation and used for histologic sections. It was found that an adhesion between Descemet's membrane of the host cornea and that of the graft had taken place. According to the opinion of the author, this adhesion might have hastened the process of healing between the graft and the surrounding cornea. As regards the fate of the stroma tissue of the graft, the author admitted the possibility of true healing, as well as that of invading growth from the host cornea.

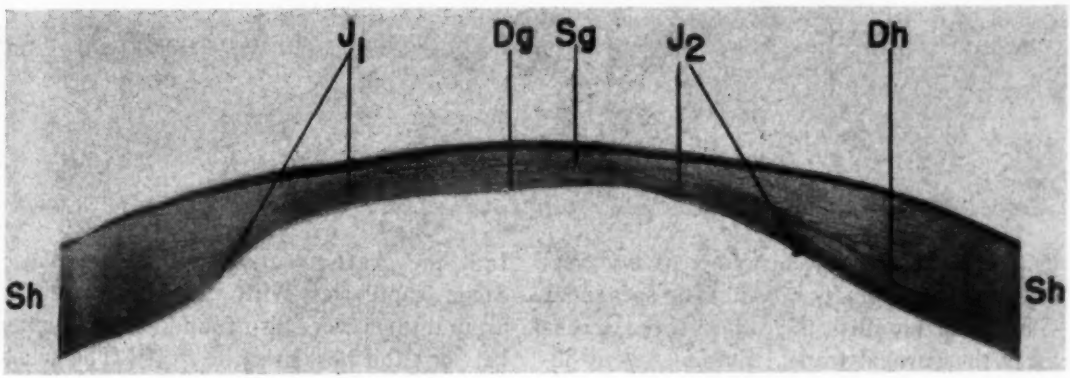
Filatov,[19] in 1935, was able to report his own clinical case in which the transplanted cornea retained its transparency for three years, until the patient's death. The transplantation was done on a leukoma that formed due to interstitial keratitis. The histologic findings were given in great detail. The epithelium over the center of the graft became thinner. Bowman's membrane of the host's leukoma was indistinct, but that of the graft remained well preserved. The stroma of the host cornea was infiltrated more under the epithelium than in its posterior portion. Some infiltration, though to a lesser degree, was also present in the tissue of the graft. At the junction, the substantia propria was scarred and contained remnants of cellular infiltration and blood vessels mostly in the anterior layers. The beginning of the transplant could be identified by the appearance of the corneal lamellae, which at a short distance from the scar acquired the arrangement of a normal cornea and preserved it along the entire length of the transplant.

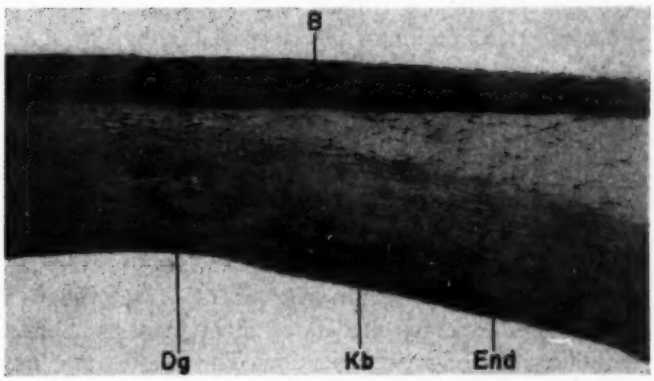
Descemet's membranes of the host and graft were both present, separated from each other by scar tissue. No endothelium, either of the host or of the graft, was present. There was an iris adhesion in this specimen. In considering the pathologic changes, Filatov was rather skeptical in the interpretation of his findings. "Does the permanent transparency of the transplant signify that an actual union has taken place, or does a substitution of the transplanted cornea by regenerated corneal elements of the host occur? This question is of great pathologic interest, and cannot be answered decisively at present." Filatov, however, concluded that the transplant as such remained well preserved and was distinctly separated from the host tissue by the fibrous ring, and that Bowman's and Descemet's membranes undoubtedly belonged to the transplant.

In the same year, 1935, Thomas[42] pub-

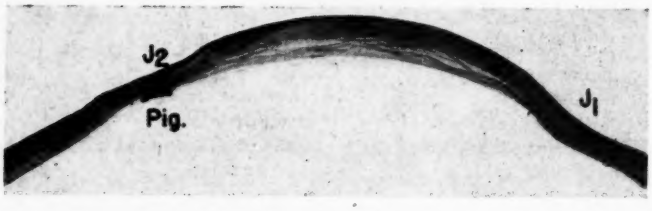
KEY TO THE ABBREVIATIONS IN THE FIGURES

A.c.: anterior chamber;
B.: Bowman's membrane;
b.v.: blood vessels;
b.v.l.: blood vessels cut in length;
C.: cornea;
Ce: corneal edema;
Cg: graft cornea;
Ch: host cornea;
c: cystic formation;
cy: cyclitic membrane;
D: Descemet's membrane;
d: denuded surface;
Dg: Descemet's membrane of graft;
Dh: Descemet's membrane of host;
End: Endothelium;
End.c: endothelial cyst;
Ep: Epithelium;
Ep.c: epithelium cornified;
Ep.d: epithelium detached;
Ep.f: Epithelial fold;
Ep.h: epithelium of host;
Ep.i: epithelium in growth
Ep.j: Epithelium of junction;
F: thickened fibrinous membrane;
f: fibrin or fibrinous clot;
Fib: fibroblasts;
fib.t: (f.t.) fibrous tissue;
f.s.: fibroblastic synctium
g: interval between host and graft;
g.c.: giant cells;
g.t.: granulation tissue;
i: iris;
id: indentation;
Inf.: infiltration;
J: junction between host and graft;
Kb: keratoblasts;
L: lens;
Pig: pigment adhesions;
R.d: retina detached;
S: suture;
Sc: sclera;
S.t: scar tissue;
Sg: stroma of graft;
Sh: stroma of host;
Sp: space;
t.n.: tissue necrotic;
u.p: uveal pigment;
v: vacuoles.

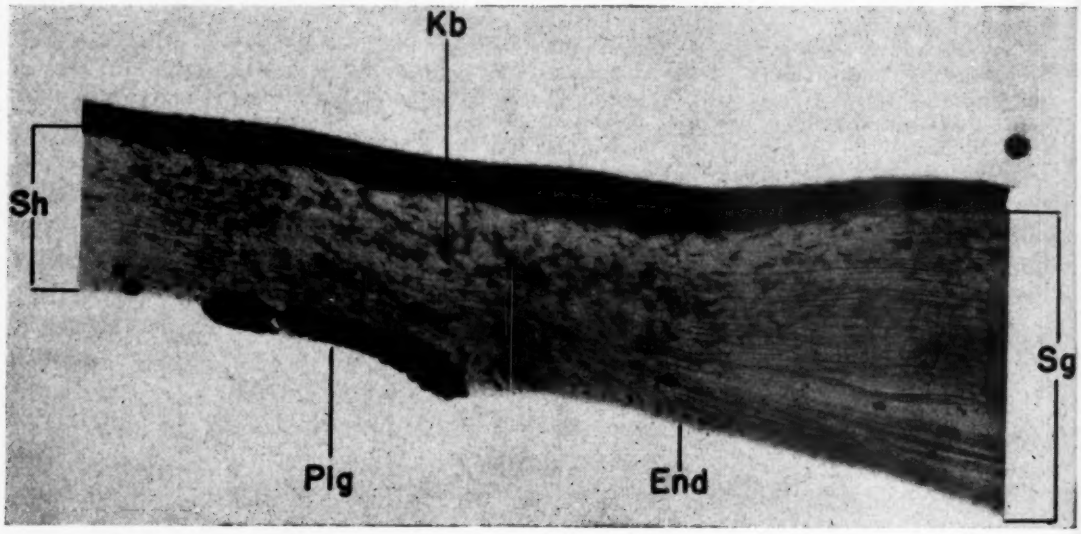




Figs. 1a and 1b (Katzin and Kuo). 1a (above). *Section through a transparent graft 4½ months after operation.* The epithelium extends evenly over the surface of the graft and that of the host with some thickening over the junction J_1; the stroma shows parallel arrangement of its lamellae and appears thinner than that of the surrounding host; Descemet's membrane of the graft is folded at J_1, but shows brushlike extensions at J_2; the endothelium shows budlike proliferation near J_2. 1b (at right) *Section of junction J_2 of Figure 1a under high power.* The thin homogeneous acellular layer B under the epithelium shows the weakly developed Bowman's membrane; the end of Descemet's membrane of the graft Dg is seen to show brushlike extensions, radiating into a group of keratoblasts Kb in the stroma of the junction; some thickening of the endothelium is noted.



Figs. 2a and 2b (Katzin and Kuo). 2a (at left). *Section through a translucent graft 21 days after operation.* The epithelium has an even surface but shows variations in thickness. The stroma lamellae of the graft appear slightly wavy and loose. Pigment adhesion on posterior surface at Junction J_2. 2b (below). *Section of junction J_2 of Figure 2a under high power.* Note the abundance of keratoblasts in the stroma tissue.



lished his data on the histology of two successful corneal grafts in man. The specimens —one six months, the other three weeks after the corneal transplantation—were obtained after the patients' deaths. Both grafts were successful in a clinical sense. The microscopic examination of the case six months after operation revealed good union of the graft edge with the host cornea. The epithelium appeared slightly thickened at the margin of the graft. Bowman's membrane was present but was separated in some places from the epithelium by a thin layer of fibrous tissue with long flattened nuclei. In the stroma of the graft, the fibers were found regular and well defined throughout, without signs of vascularization. The original host cornea was characterized by an increased number of nuclei which were interrupted by the scar formation at the margin of the graft. The nuclei did not seem to invade the graft to any appreciable distance. Some capillaries with cellular infiltration around them were also found at the junction between the host and the graft. The whole graft stroma appeared thicker than that of the host. No sign of newly formed Descemet's membrane was noted. The ends of Descemet's membrane of the graft and the host cornea did not meet. The former were folded. Behind Descemet's membrane of the graft, there was new tissue formation extending the whole length of the graft. The thin layer of fibrous tissue consisted of fibers regularly dispersed in parallel fashion with nuclei that were long, thin, and flat and with pointed ends. This, the author believed, was not incompatible with a graft that was clinically transparent.

The case of three weeks' duration manifested a histologic picture which in the regularity of the lamellar arrangement and

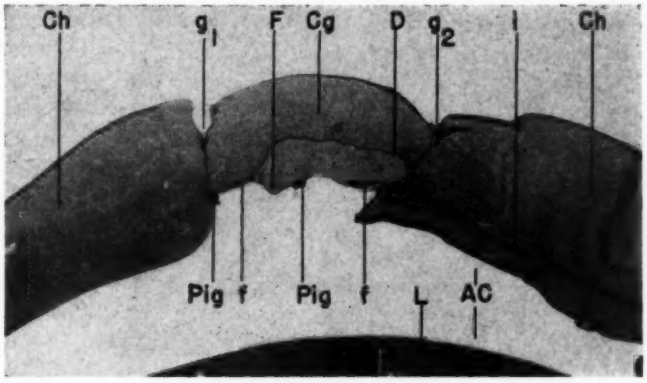


Fig. 3 (Katzin and Kuo). *Section through an edematous graft three days after operation.* The epithelium is proliferating into the wounds g_1, g_2. The stroma tissues of both the host and the graft appear markedly edematous. Descemet's membrane D of the graft is wrinkled. Fibrinous membrane F is seen behind it. Pigment adhesions and iris adhesions are present.

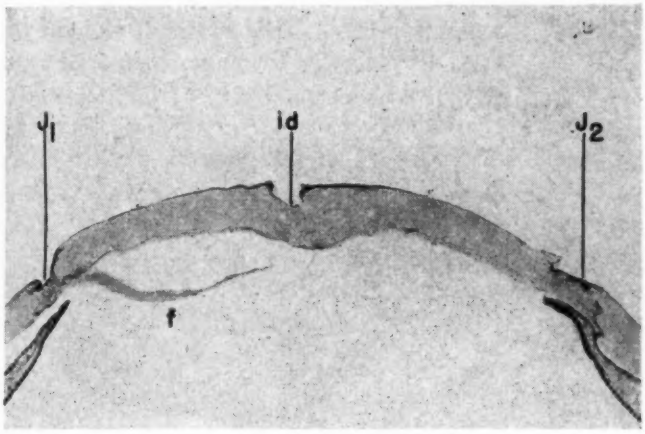


Fig. 4a (Katzin and Kuo). *Section through an edematous graft four days after operation.* The epithelium of the graft shows variation in thickness, peeling off in places, and proliferating over the suture indentation (id) at the center. The stroma appears edematous, its structure loose. Fibrinous mass f is seen in the anterior chamber.

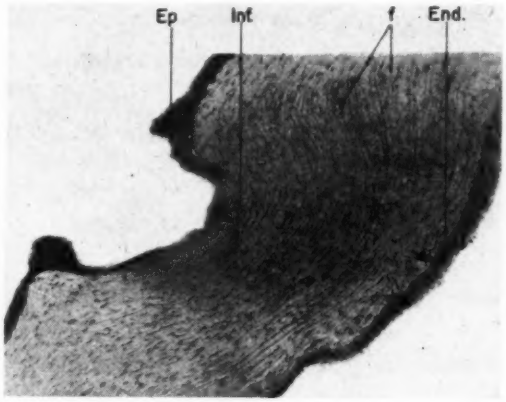


Fig. 4b (Katzin and Kuo). *Section through the indentation (id) of Figure 4a.* The proliferated epithelium over the edges of the indentation and the wide interlamellar spaces filled with fibrinous fluid f are well illustrated. Some cellular infiltration Inf. is seen in the stroma beneath the indentation.

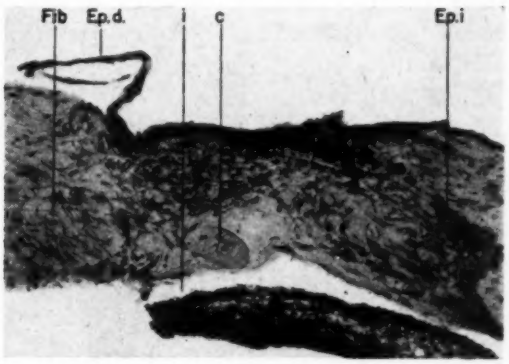


Fig. 4c (Katzin and Kuo). *Section through junction J_1 of Figure 4a.* Epithelium Ep.i is seen lying in the stroma tissue between the host and the graft and partially peeling off Ep.d in its total thickness over the surface of the graft. Numerous fibroblasts are present in the stroma.

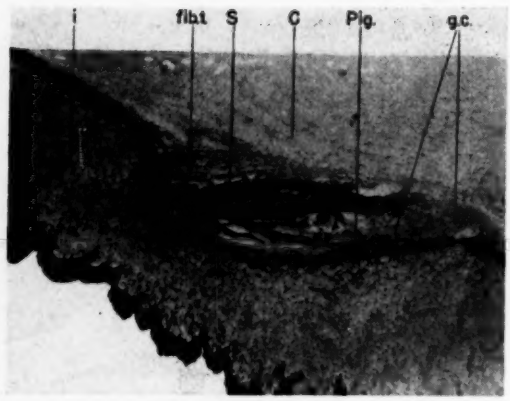


Fig. 5 (Katzin and Kuo). *Section through the adhesion between cornea and iris.* A silk suture S is embedded between cornea and iris and is surrounded by giant cells g.c. and fibrous layer fib.t.

nuclear content of the graft stroma was very normal in appearance. Marginal scar tissue was also present. The epithelium was continuous throughout. Bowman's membrane of the graft was also of the same thickness as in the donor cornea. There was tissue formation behind the graft of the same nature as in the previous case.

The descriptions by this author seem to show his preference for the theory of true healing, although he did not make any definite comment in this connection.

Castroviejo,[9] in 1937, included in his detailed histologic reports one case of microscopic examination of an opaque human cornea three months after a heteroplastic

Fig. 6 (Katzin and Kuo). *Section through an adhesion between cornea and iris.* A suture S is embedded in the corneal tissue and is encapsulated by giant cells and a fibrous tissue layer as in Figure 5.

transplantation with the cornea of a monkey (macaccus rhesus). The microscopic examination revealed, "in the central part of the cornea, a necrotic area outlined on one side by blood vessels and lymphocytic infiltration, on the other side there was a perforation through which the lens capsule, lens matter, and vitreous were extruding. A dense lymphocytic infiltration along the entire surface of the cornea between the epithelium and the stroma was also seen. In the necrotic central plug or graft, there were many giant cells."

Subsequent histologic examinations of clinical cases were found in articles by Velter[44] in 1940, Babel[3] in 1945, and by Fieandt[16] in 1946. Velter published, in 1940, 18 corneal transplants; 15 of these were ob-

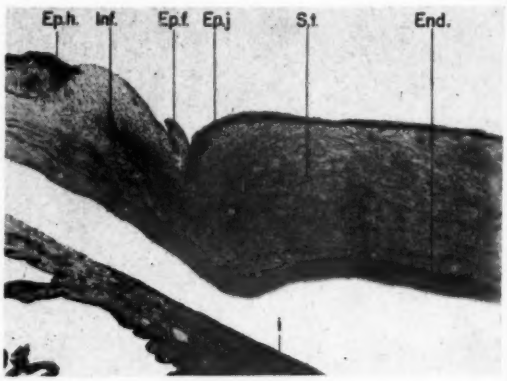


Fig. 7 (Katzin and Kuo). *Section through an opaque graft 22 days after operation.* A typical angular junction between the host and graft is noted, due to the effect of a tight suture. The epithelium is varied in thickness and presents a peculiar fold Ep.f. at the junction. Note the irregular pattern of the scar formation.

tained surgically when secondary transplants were used to replace the primary opaque ones. Three were obtained from eyes enucleated for glaucoma. The epithelium was usually thickened, sometimes vacuolated. Bowman's membrane was usually normal. The substantia propria showed only insignificant changes. Descemet's membrane was found preserved in over half of the cases and was usually detached and curled. The endothelium was absent in all cases. The demarcation between the transplant and the

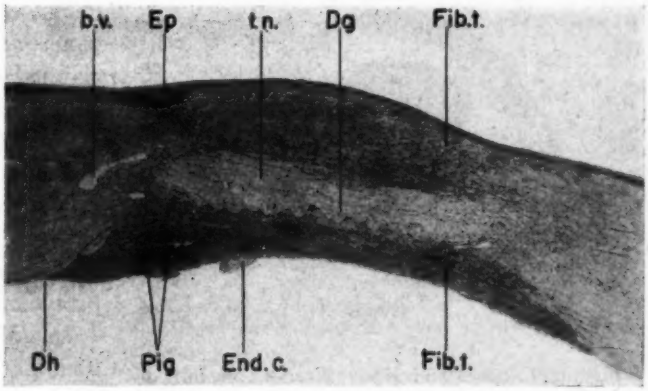


Fig. 8a (Katzin and Kuo). *Section through an opaque graft one month after operation.* The epithelium is thickened over the junction but thinner over the graft. Anterior and posterior fibrous tissue layers are present; wrinkled Descemet's membrane, necrotic tissue area t.n., pigment granules, and an endothelial cystic formation End.c. are seen in the part of the graft. Vascularization at the junctions and Y-shaped Descemet's membrane of the host are clearly illustrated.

scar was very sharp in all cases. Membranes were found developed behind the graft in 7 out of 18 cases; in 6, they originated in the corneal scar. The iris, when adherent to the transplant, did not contribute to the formation of the connective tissue invading the transplant. The author seems to be in favor of the true healing theory.

Babel,[3] in 1945, after presenting his 11 cases of transplanted corneas, ranging from four days to five years after operation, claimed to have substantiated the experimental findings of Bonnefon and Lacoste. The graft tissue, including Bowman's membrane, stroma lamellae, and Descemet's membrane, remained intact and was not replaced by the surrounding corneal tissue. The author mentioned, however, that the stroma tissues of the graft showed a marked degree of swelling, pyknosis of the nuclei, and so forth, as if they would subsequently disappear and be replaced by the surrounding elements. The epithelium may manifest signs of proliferation, overgrowing the wound edge and preventing the proper union between the host and the grafted cornea.

Fieandt's[16] case was the enucleated eye of a patient with interstitial keratitis, treated by corneal transplantation with subsequent development of an anterior chamber cyst. The histologic picture, the author believed, supported the view of true healing of the graft, because the transplanted area contained all the corneal layer. Bowman's membrane was found in the transplant, but was partially absent in the surrounding cornea and completely absent at the margin of the transplant.

Although the clinical histologic data is limited, experimental histologic reports are so much more numerous and elaborate, that we will simply summarize.

Salzer's[30-35] work along these lines seemed to be most comprehensive. His publications appeared between 1898 and 1945. According to this author, the fate of the transplanted cornea is that of gradual replacement by the host corneal tissue, in which the epithelial cells of the host cornea play the main role in the process of regeneration. Thus Salzer[30]

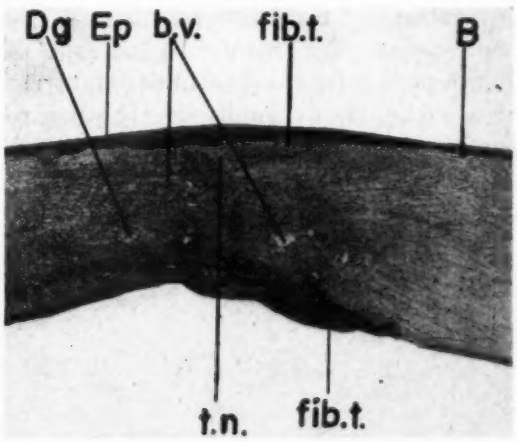


Fig. 8b (Katzin and Kuo). *Section through the same opaque cornea as Figure 8a.* The epithelium is thickened over the graft. The fibrous stroma of the graft is seen vascularized. A ring of Descemet's membrane Dg. is present. The necrotic area t.n. is seen more anteriorly than in previous figure.

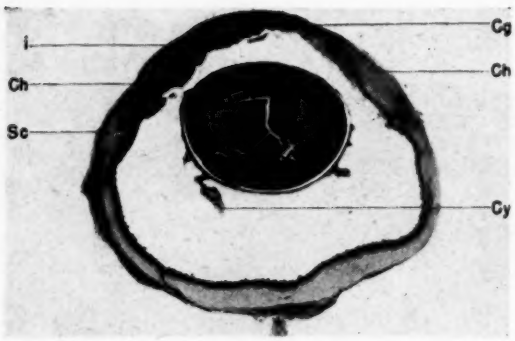


Fig. 9a (Katzin and Kuo). *Section through an eyeball of an opaque graft one month and 24 days after operation.* Total anterior synechia is noted. The graft tissue is totally cicatrized; edema is present in the host cornea as well as in the sclera.

said, in 1908, "The fact that heteroplastic operations have been performed with success, even in those cases where heteroplastic material from animal corneas from different species were used, is from the scientific point of view enough proof that there can be no true transplantation in the operation of keratoplasty, but rather that the graft heals only as a dead tissue or foreign body."

In order to show the regenerative power of the cornea, amplifying the results of Ribbert,[29] Salzer carried out the following experiment: He cut a pocket in the cornea of a rabbit and used different materials for implantation: egg membrane, a flap of guinea-pig's cornea, or a flap of the cornea of a rabbit. Two months later he carried out histologic examinations of these specimens and found profound changes in all parts of the implanted tissue. Although Salzer claimed on the basis of his results that regenerated tissue actually invaded the implanted material, he was rather skeptical in drawing any definite conclusions and suggested that further experiments with different materials and different staining methods should be pursued to bring more light to this problem.

In 1910, Salzer[32] carried on another series of experiments in which he implanted a flap of formalinized horse cornea in the cornea of a rabbit and found that the implant actually "healed." The microscopic examination three months after the implantation showed that, although the whole implant was still recognizable, the margins appeared to be absorbed and replaced by invading regenerating tissue. Subsequent observations found that in one specimen, the implant had entirely disappeared after a period of about 15 months, clinically as well as histologically.

In the same year, Salzer[31] made another interesting observation, based on the results obtained by Nielson and Angelucci, on the filling in of a large defect in the rabbit's cornea produced with a trephine. It was found that the hole was eventually filled up with newly formed corneal tissue which, in the course of a few weeks or months, resulted in almost normal transparency. The whole process took place on the basis of a fibrinous clot which initially bridged the hole

Fig. 9b (Katzin and Kuo). *Part of the section of Figure 9a through the cornea of the host and the adherent iris.* Note the total denudation of the epithelium; the stromal edema and the total anterior synechia of the iris.

and was subsequently organized. The whole regenerative process was not accompanied by any sign of vascularization whatsoever.

In the year 1921, Salzer[33] discussed the significance of this regenerative capacity of the cornea from the clinical point of view. The corneal defect in cases of perforation due to blennorrhea neonatorum is often filled with regenerated corneal tissue so completely, that only insignificant opacity remains. A unique case of Elschnig, reported by Ascher, was cited of a 12-year-old boy whose one eye suffered from deep keratitis. The cornea of this eye was trephined without receiving a graft. After seven years, the defect was replaced by completely transparent corneal tissue. The surrounding cornea also became transparent, leaving only a very fine ring surrounding the regenerated tissue.

In the course of his studies, Salzer[33] found that the regenerative process of the cornea is associated with the activity of the keratoblasts, which seemed to be most abundant in the subepithelial layer of the cornea. On the basis of this observation, together with additional microscopic evidence, Salzer believed that the keratoblasts are of epithelial origin. He performed homo (rabbit cornea to rabbit) as well as hetero (horse cornea to rabbit) implantations and obtained histologic preparations which substantiated his view regarding the origin of the keratoblast.

The more recent work of Salzer,[34] in 1937, may be summed up as follows: In higher animals, transplanted tissue does not remain intact for a long time, but soon undergoes slow degeneration. At the same time, as a result of the natural regenerative tendency of the wound regions, newly formed tissue elements from the surrounding host tissue enter into this substance and gradually replace it, provided there is no infection or inflammation in which case a cicatricial mass will result. Regeneration of corneal wounds originates from the spindle cells lying directly below the corneal epithelium, called keratoblasts, which enter into and replace the transplanted corneal disc. The fixed

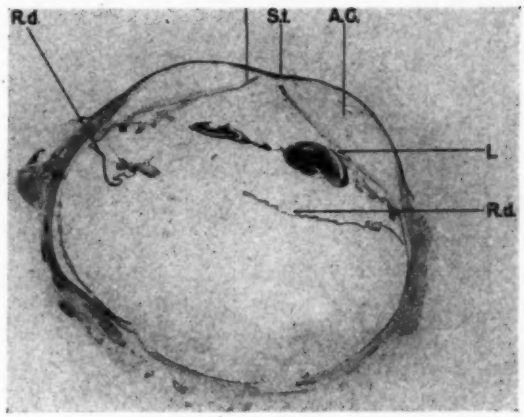


Fig. 10a (Katzin and Kuo). *Section through a hypotonic eyeball, which has lost its graft and healed (2½ months after operation).* Note the total detachment of the retina and the slight invagination over the healed corneal scar S.t. The lens has been largely extruded, and the margins of the iris are adherent anteriorly.

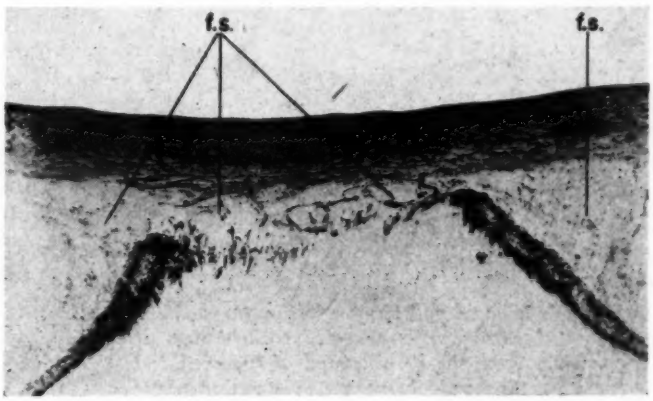


Fig. 10b (Katzin and Kuo). *Section through the central portion of the healed corneal scar of Figure 10a,* showing the fibroblastic synctium f.s. connecting the iris tissue with the posterior surface of the healed cornea. The stromal lamellae are in fairly parallel arrangement.

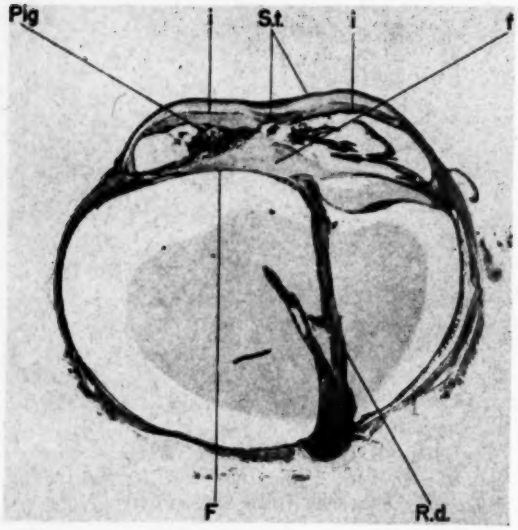


Fig. 11a (Katzin and Kuo). *Section through a hypotonic eyeball, which has lost its graft and healed (3 months and 2 days after operation).* Note the absence of the lens and the total detachment of the retina. The healed corneal scar appears also slightly invaginated as in Figure 10a.

corneal cells do not take part in the regenerative process. That the replacement of corneal graft tissue must originate from the epithelial layer is consistent with the new embryologic conception that does not hold firmly to the specificity of the germinal layers. It is of no consequence whether one uses discs from the same species or from widely different ones, for even dead materials kept in preserving fluids have been

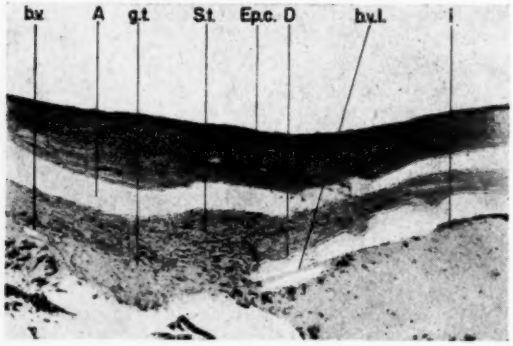


Fig. 11b (Katzin and Kuo). *Section through the invaginated portion of the healed corneal scar of Figure 11a.* Note the cornification of the epithelial surface and the presence of the granulation tissue between the corneal scar and iris tissue.

successfully transplanted. For a successful transplantation, it is necessary that the leukoma should contain well-preserved corneal elements from which regeneration may proceed. Total adherent vascular leukoma forms an unsuitable bed for transplantation.

Salzer's[35] publication, in 1941, dealt with the results of studies in comparative histology and embryology, as well as tissue cultures. All seemed to point to the same conclusion, that the cornea is epithelial in origin, development, and regeneration.

In 1910, Loehlein[28] published his histologic report of a rabbit cornea three months after transplantation. There was thickening of the epithelium as well as penetration of the epithelium into the stroma. No sharp demarcation existed between the graft and the host cornea. No changes in Bowman's and Descemet's membranes of the host were noted. A slight degree of vascularization prevailed in the marginal region between the host and the graft.

Bonnefon and Lacoste,[7] in 1913, based on 200 partial lamellar keratoplasties in animals and histologic studies on the specimens ranging from 10 hours to five months after operation, concluded that the only elements preserved up to five months were the epithelium, the lamellae of the corneal stroma, and a few corneal corpuscles. Most of the corpuscles were regenerated (immigrant fibroblasts) and in time the stroma of the cornea was probably also replaced slowly by new stroma.

Forster,[20] in 1923, prepared a review of keratoplastic surgery and reported his own experiments on the subject. He concluded that a successful graft from another species is a biologic impossibility because it is inconsistent with the biologic law of tissue specificity.

Castroviejo,[8] in 1932, carried out a detailed histologic examination on normal rabbit corneas on which partial penetrating keratoplasty had been performed. The transparent grafts showed no signs of replacement by the host. In 1937, Castroviejo[9] made

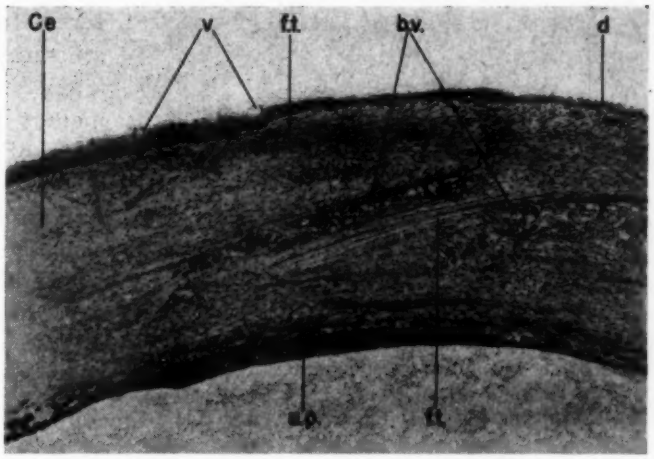


Fig. 12 (Katzin and Kuo). *Section through a formalinized opaque graft two months and 21 days after operation.* The epithelium is vacuolated; the stroma tissue is scarred with cellular infiltration, vascularization, and edema. The iris pigment is adherent and interwoven with the corneal stromal tissue.

another series of histologic studies based upon some 300 partial penetrating keratoplasties on normal and pathologic corneas of different species of animals and on 80 keratoplasties of the same type on human beings. His results appeared to show that the transparent corneal graft retained its individuality and preserved its own cellular elements. There is no evidence of a gradual replacement of this type of graft by the tissue of the host. He mentioned as the main causes of nebulosity and opacification of a graft:

1. Poor coaptation of the margins of the implanted segment into the cornea of the host.
2. Postoperative infection.
3. Incarceration of intraocular structures with subsequent development of connective tissue behind the graft.
4. Vascularization of the graft always associated with infiltration of the stroma by wandering cells.

Thomas,[39] in 1931, published a case of experimental corneal transplantation in a rabbit to replace a central opacity. His histologic study revealed that the opaque graft was densely nucleated and contained many connective tissue cells with spindle-shaped nuclei. A second series of three cases also of Thomas's[40] reported in the same year, showed that the degree of clarity of the graft was closely associated with the extent to which the iris was adherent.

In 1934, Thomas[41] performed transplantations on rabbits, using devitalized grafts heated in olive oil at 100°C. for a few seconds, and obtained good healing. There was some degree of thinning of the graft tissue and a linear scar was formed around

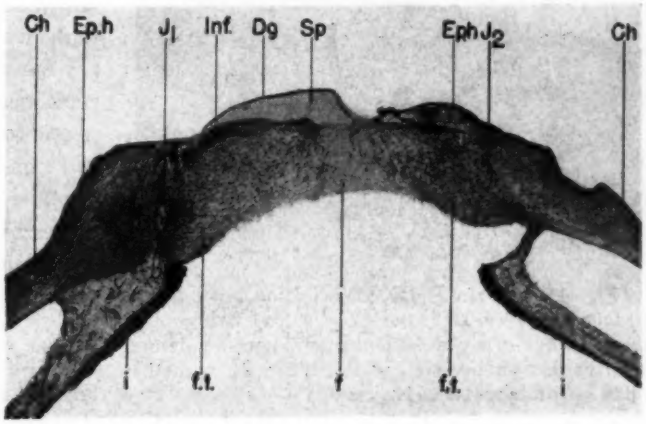


Fig. 13 (Katzin and Kuo). *Section through an opaque graft (frozen and dehydrated) 16 days after operation.* The entire tissue of the graft has been lost except for Descemet's membrane which can be seen on the anterior surface. Partly organized fibrin fills in the gap, which is beginning to be covered with epithelium. Note the polymorphonuclear infiltration in the stroma tissue near the junctions.

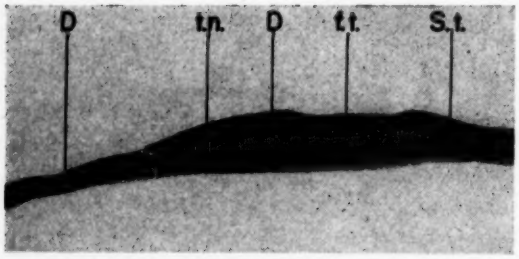


Fig. 14 (Katzin and Kuo). *Section through an opaque graft (frozen and dehydrated) 26 days after operation.* The epithelium appears uneven over the graft. Note the anterior and posterior layers of fibrous tissues with necrotic tissue in between. Descemet's membrane of the graft is wrinkled.

the graft. The reaction of the eye was minimal and the graft tissue remained avascular. Because of the thickening and contracture of the heated graft tissue, the posterior portion was cut off before being implanted so that the transplant actually consisted only of the epithelium and the anterior layers of stroma. Nevertheless, the graft took well. The author concluded that union between the graft and the host cornea could only have taken place by virtue of regenerative activity on the part of the surrounding corneal tissue.

In 1936, Thomas[43] carried out experiments on heterogeneous corneal grafts on six rabbits, using human cornea on one, and cats' corneas on the remaining five. It was found that the heterogeneous grafts could also unite with the host's cornea, but unlike

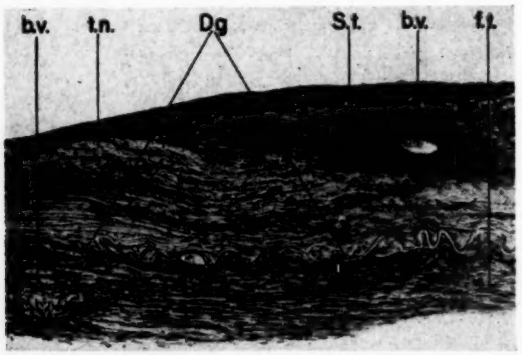


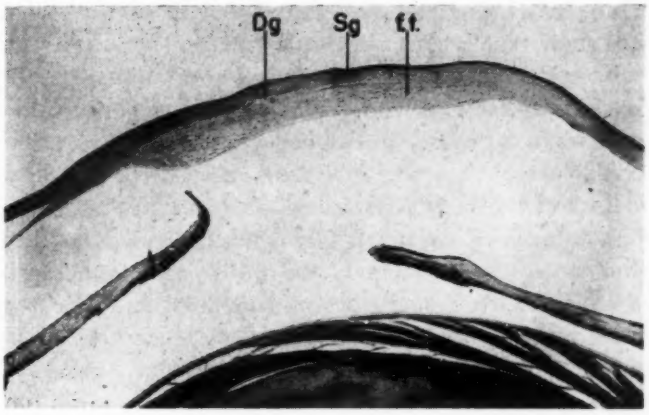
Fig. 15 (Katzin and Kuo). *Section through an opaque graft (frozen and dehydrated) one month and 11 days after operation.* Histologic details are seen in this picture similar to Figure 14, with the addition of blood vessels.

successful homogeneous grafts, they did not remain transparent, but became vascularized. After a period of 3 years and 10 months in one specimen, the graft was composed of tissue derived from the host cornea, but Descemet's membrane remained. The original stroma of the graft was retained to some extent, in the form of isolated fibers, subepithelially, and a homogeneous mass in its posterior portion where no blood vessels were present. This finding seemed to warrant the conception that the tissue was tolerated but largely ostracized by the recipient eye.

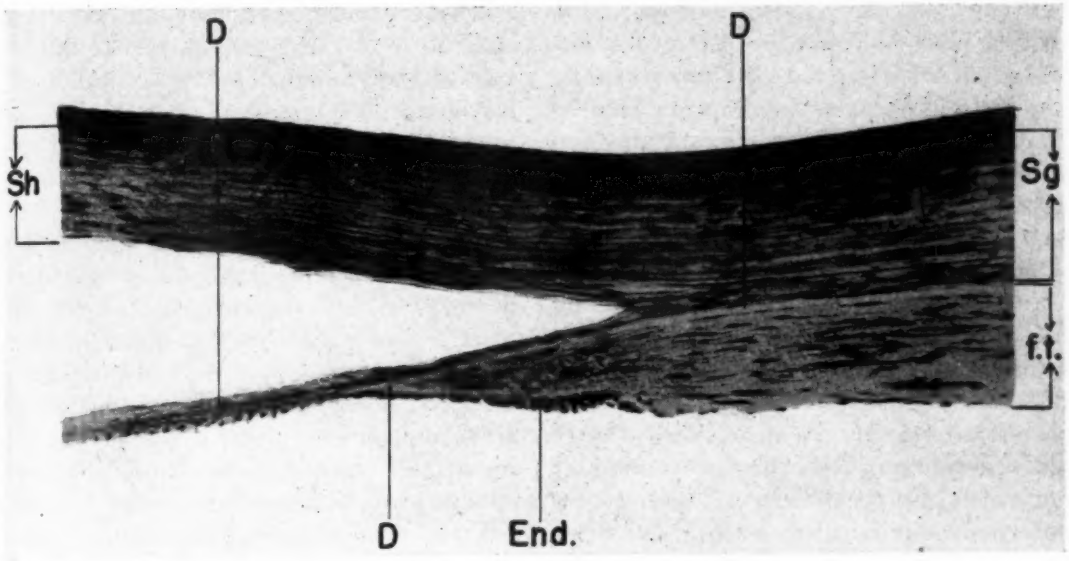
Kiyama[27] in 1934 claimed to have proved the theory of true healing of a transplant from a histologic as well as immunologic point of view. It was first shown that tissue juice of the chicken embryo hastened the process of corneal epithelial regeneration of an artificial defect in a rabbit's cornea, and that the addition of a mixture of tissue juice and secondary aqueous promoted the healing of the graft in its bed. Subsequent histologic examination revealed that all layers of the graft tissue were well perserved. His immunologic experiment showed that a corneal transplant taken from a rabbit immunized against vaccine virus, retained its immunity after being transplanted. Kiyama concluded, therefore, that a cornea can be transplanted without dying and that true keratoplasty exists.

Scherschewskaya,[36] in 1940, carried out 37 experimental keratoplasties on rabbits with formalinized transplants. Of these, 12 healed, with retained transparency in three cases. Of five keratoplasties on human beings, one remained clear. Detailed histologic data were presented both for opaque and clear grafts. No conclusive interpretation was given for the histologic pictures, except that the formalinized grafts can actually heal and become transparent, thus substantiating the experimental data of Salzer to the fullest extent.

Deutman,[12] in 1940, used formalinized cornea for keratoplastic operations on five



Figs. 16a and 16b (Katzin and Kuo). 16a (right). *Section of an opaque graft (frozen and dehydrated) six months after operation.* Note how the necrotic tissue of the graft has been organized into fibrous tissue. 16b (below). *Section through the junction between host and graft of Figure 16a.* Note the Y-shaped extension of the host's Descemet's membrane and the thickening of the endothelium.



normal rabbit eyes. All the transplants clinically observed during the period from 3 to 11 months, postoperatively, remained opaque, due to connective-tissue formation behind the graft. From the histologic pictures, the author had the impression that the formalinized transplant was surrounded by the neighboring corneal tissue in an attempt at encapsulation.

Sena,[37] in 1941, reported two cases of experimental keratoplasty on rabbits with subsequent histologic examination. The author concluded that the histology showed definitely the maintenance of cellular autonomy on the part of the transplants.

Wiener and Rosenbaum,[46] in 1941, published their experimental data on 22 formalinized heterogeneous and homogenous corneal transplantations, five of which were formalinized dog cornea to rabbit and 17 were chemically fixed rabbit cornea to rabbits. The heterogenous transplants caused more reactions in the eye than the homogenous transplants, where 8 out of 9 healed, and three of these showed definited signs of clearing. From the histologic sections it was seen that the epithelium and the endothelium of the graft had been derived from the corresponding layers of the host. Descemet's membrane, on the other hand, was probably the remnant of the donor material. Regarding the fate of the stroma

of the graft, the authors believed that there was some true replacement taking place.

Imre,[23] in 1942, reported clinical and histologic experiments with corneal grafts on more than 20 eyes. No detailed reports are available.

Bashoff,[5] in 1946, described 30 cases of keratoplasty. Results of formalinized and autografts were compared. Of the former, the results were negligible to bad. In the autografts, 13 good results were obtained out of a total of 17 cases.

Comment on the literature

From the foregoing review of the literature, it is evident that the controversy between the leading points of view, regarding the biologic process taking place between the graft and the host cornea, has been going on for 5 or 6 decades and, in spite of the numerous publications, clinical as well as experimental, as reviewed above, no solution has yet been reached.

In general the conception of true healing has been built chiefly upon these arguments:

1. The original graft tissue remains unchanged, especially Bowman's and Descemet's membranes. The graft stroma does not totally disappear even 2½ years after operation, as reported by Fuchs,[22] and three years, as reported by Filatov.[19] Only the epithelium and endothelium seem to have been replaced.

2. The biologic principle of the individual specificity of tissue is inconsistent with the conception of active regeneration of the cornea. So said Forster,[20] "Transplantation from another species is a biological impossibility." The repeated failures reported in the literature of heterogeneous transplants seem to speak in favor of this conception.

3. The fact that devitalized transplants seldom succeed in taking and even more seldom remain transparent proved that, in order for a transplant to heal, the preservation of its vitality is necessary.

4. Immunologic experiments by Kiyama[21] have shown that the transplant retains its acquired immunity against vaccine virus even after it has healed to the donor tissue, so that any replacement of the donor tissue can be excluded.

5. That the transplant possesses unusual vitality is demonstrated clinically by its therapeutic effect in promoting the process of clearing and absorption of opacity in the vicinity of the graft as shown by the so-called "amelioration" treatment of Filatov,[17] and by the healing effect on serpiginous ulcers, as reported by Chechik-Kunina.[10]

6. The clinical experience of Elschnig[14] and Filatov,[19] which emphasizes the importance of normal surrounding corneal tissue for the maintenance of nutrition of the transplant, is but another evidence that the transplanted cornea actually possesses its own vitality.

The proponents of the regeneration theory, on the other hand, base their data chiefly on the experimental results of Salzer.[30-35] They believe that corneal tissue, like most other tissues of the body, possesses the power of regeneration by virtue of which the transplant is replaced eventually by the regenerated corneal tissue from the surrounding host. Thus the transplant does not retain its own structure, but merely acts as a dead foreign body, which is absorbed and disappears within the tissue of the host. They support their theory by the following data:

1. Implanted egg membrane and heterogeneous corneal tissue from a guinea pig placed in a pocket in a rabbit's cornea were found histologically to be invaded by the regenerated corneal tissue from the surrounding host.

2. Formalinized horse cornea implanted in the same manner first healed and then disappeared 15 months after implantation so completely that no trace was demonstrable, either clinically or histologically.

3. Corneal wounds uncovered by any

graft tissue when left alone can regenerate in the region of the gap with newly formed corneal tissue which is almost indistinguishable from normal cornea histologically.

Besides successful grafting with formalinized corneal tissue in animal experiments, as shown by Scherschewskaya,[36] and Wiener and Rosenbaum,[46] clinically transparent transplants have also been obtained in human beings with formalinized grafts by Scherschewskaya. Thus she said, "The healing of formalinized discs with preservation of their functional capacity can only be explained from the point of view of hidden regeneration or, in other words, by the role of the transplant as a carcass." But even more precise are the remarks of Wiener or Rosenbaum,[46] "If there is a true replacement, it is an extremely orderly one, and yet this must be the modus operandi, for surely one cannot conceive that dead tissue, such as formalinized cornea undoubtedly is, could be revitalized."

5. The reported success of heteroplastic transplantations on animals, as one finds in the literature (and clinically the case of lamellar keratoplasty by Von Hippel,[45] in 1888, using a dog cornea for a man where a graft actually "healed" with some degree of transparency) alone tends to disprove the theory of the biologic specificity of the corneal tissue. As Salzer says, "Since we are always dealing with the healing of a dead tissue, or a tissue which is sooner or later going to disappear, and not dealing with a true transplantation, it is absolutely indifferent (except from the mechanical and technical point of view) whether the graft is taken from the same species or from a widely different one."

Methods and Materials

Before we express our opinions on the subject, we wish to present our own experimental data in this connection for reference.

The material to be presented was obtained from a study of over 200 corneal transplantations on rabbits, and over 100 histologic sections of operated eyes. The technical methods of transplantation are presented elsewhere in the publications of one of the authors (H. M. K.).[24-26] Some of the operations were done with the use of sutures and some were done with fibrin as an adhesive to cement the graft in place. The rabbits were killed after a variable period of time up to nine months after operation, and the eyes were fixed in formalin and stained with hematoxylin and eosin. Some of the donor eyes were preserved in saline, some in other buffered physiologic solutions, some in merthiolate, and some in a moist chamber. Several transplants were obtained from formalinized eyes and some grafts were preserved by freezing and dehydrating at very low temperatures.[25] The sections were selected as typical of certain types of tissue reactions of interest to the ophthalmologist. The data on these sections will be found in Table 1 and the descriptions of the figures in Table 2.

Discussion of the Histologic Findings

Epithelium. The epithelium of the host grows rapidly into the wound at the margin of the graft and is the first cellular repair mechanism. In early sections epithelial cells can be seen lying between the stroma of the host and the graft.

Ordinarily these epithelial cells disappear later. There has been some controversy as to whether they are transformed into keratoblasts. It is our belief that the epithelium of the graft is lost within the first three days after transplantation and this is replaced by the growth of the host's epithelium.

The epithelium tends to fill in uneven surfaces and will be thicker in some places than in others in order to maintain a smooth optical surface. When the intraocular pressure is normal, the epithelium presents a fairly normal appearance after transplantation. When there is glaucoma, the cells become vacuolated, swollen, and cornified.

Bowman's membrane. In the rabbit, Bow-

TABLE 1

DATA ON HISTOLOGIC SECTIONS OF CORNEAL TRANSPLANTS IN RABBITS

Slide No.	Case No.	Fig. No.	Time Elapsed after Operation	Preservation of Donor Eye	Sutures Used	Diameter of Disc	Postoperative Course	Clinical Result
315 O.S.	1	1a 1b	4½ months	4 hrs. in saline at +2° C.	fibrin	6 mm.	Slightly hazy on 12th day, then clearing, no synechia	Clear
323 O.S.	2	2a 2b	8 months 21 days	2 hrs. in saline at +2° C.	fibrin	4.5 mm.	Uneventful except for anterior synechia, at 6 o'clock, detached on atropinization	Translucent
347 O.S.	3	3	3 days	4 days in 1.1% $NaHCO_3$ Sol. at +2° C.	fibrin	4.5 mm.	Graft found edematous, anterior synechia	Opaque Edematous
305 O.D.	4	4a 4b 4c	4 days	4 hrs. in 1/20,000 Merthiolate at room temperature	silk	5.5 mm.	Anterior synechia	Edematous sl. cloudy
305 O.D.	5	5	4 days	4 hrs. in 1/20,000 Merthiolate at room temperature	silk	5.5 mm.	Anterior synechia	Edematous sl. cloudy
305 O.D.	5	6	4 days	4 hrs. in 1/20,000 Methiolate at room temperature	silk	5.5 mm.	Anterior synechia	Edematous sl. cloudy
344 O.S.	6	7	22 days	3 hrs. in saline at +2° C.	fibrin and silk	4.5 mm.	Suture too tight, graft surface hazy, showing marks of suture	Opaque
351 O.S.	7	8a 8b	1 month	½ hr. in saline at room temperature	fibrin	5 mm.	Anterior synechia	Opaque
325 O.D.	8	9a 9b	1 month 25 days	Graft removed and replaced in situ	fibrin	5.5 mm.	Graft not well fixed iris prolapsed	Opaque Edematous
395 O.D.	9	10a 10b	2½ months	From freshly enucleated eyeball	fibrin	4.75 mm.	Graft put upside down during operation, lost, lens protruded	Opaque
361 O.S.	10	11a 11b	3 months 2 days	2 hrs. in moist chamber at +2° C.	fibrin	4.5 mm.	Graft lost, corneal tissue shrank, narrowing the gap	Opaque
310 O.D.	11	12	2 months 21 days	Formalinized	silk	5 mm. sq.	Anterior synechia formed, marked inflammation, cornea ectatic	Opaque
23 O.D.	12	13	16 days	Frozen and dehydrated	silk	4.75 mm.	Severe iritis, graft edematous, vascularized	Opaque
30 O.S.	13	14	26 days	Frozen and dehydrated	silk	5 mm.	Graft healed with anterior synechia	Opaque
21 O.D.	14	15	1 month 11 days	Frozen and dehydrated	silk	5 mm.	Disc healed with anterior synechia, opaque on 7th day	Opaque
26 O.D.	15	16a 16b	6 months	Frozen and dehydrated	silk	4.75 mm.	Iris prolapse, graft at first edematous	Opaque

man's membrane is very poorly developed and some authors state that it is entirely absent.[10] Our studies tend to show that it is present, although in a very weakly developed form. We are led to this conclusion by the fact that a thin homogenous acellular layer can be seen underlying the epithelium, and that the epithelium peels off without great difficulty. However, in the rabbit this membrane is not a true membrane as it is in the human being.

Stroma. Shortly after transplantation a considerable amount of edema occurs in the stroma not only of the graft and host cornea but of the entire sclera as well. This edema is undoubtedly due to absorption of anterior-chamber fluid through the cut margins, and it subsides as the cut stroma becomes covered over with epithelial and endothelial cells. A considerable amount of early edema is still consistent with a perfectly transparent graft. The cornea also becomes markedly edematous in the presence of increased intraocular pressure, which usually results from exten-

TABLE 2

A TABULATED DESCRIPTION OF THE FIGURES

Fig.	Epithelium	Stroma	Descemet's Membrane	Endothelium	Iris Adhesions
1a 1b	Thickened, especially over junctions	Thinner than host with normal arrangement of lamellae	Y-shaped branch uniting with host's on one end, well preserved	Proliferated at junction, single layer elsewhere	None
2a 2b	Thinner over graft, thickened over junctions	Normal thickness structure loose, lamellae wavy	Only partly preserved no union with host	Intact	Pigment adhesion
3	Thin in middle, thicker near wound edges	Edematous, lamellae normal structure	Intact, wavy, fibrinous membrane behind, no union with host	Intact, partly proliferated	Pigment and anterior synechia
4a 4b 4c	Thin, peeled off toward edges; proliferated around central suture indentation; epithelial ingrowth into stroma at junction	Suture indentation in middle; edematous, lamellae wavy; fibroblastic repair	Partly preserved, reduced in thickness	Intact, partly proliferated at junction	Anterior synechia
5	Embedded suture between iris and cornea, showing giant cells and signs of fibrous encapsulation				Anterior synechia
6	Embedded suture in corneal stroma, showing same as above				Anterior synechia
7	Proliferated over wound edge, epithelial fold	Scar tissue. Cellular infiltration	Entirely absent	Intact	None
8a 8b	Variations in thickness	Anterior and posterior fibrous tissue layers with necrotic area in between	Well preserved, curled and embedded between fibrous layers	Intact, partly proliferated	Pigment adhesion
9a 9b	Totally lost	Totally cicatrized (edema of host cornea and sclera)	Entirely absent	Absent	Total anterior synechia
10a 10b	Intact, normal in thickness, darkly stained	Cicatrized with compact fibrous tissue	Absent	Absent	Synechia with fibrous syncytium
11a 11b	Cornified with variations in thickness	Irregular compact scar tissue	Partly preserved	Absent	Synechia with granulation tissue formation
12	Vacuolated and partly lost	Vascularized, infiltrated, edematous and scarred	Absent	Absent	Total anterior synechia with pigment proliferation
13	Absen	Partly organized fibrinous mass	Curled, pushed onto anterior surface	Absent	Iris adhesions at junctions
14	Uneven and irregular	Anterior and posterior fibrous tissue layers with necrotic area in between	Well preserved, curled and embedded between fibrous layers	Intact	None
15	Uneven and irregular	Anterior and posterior fibrous tissue layers with necrotic area in between	Well preserved, curled and embedded between fibrous layers	Intact	None
16a 16b	Uneven and irregular	Anterior and posterior fibrous tissue layers	Well preserved, curled and embedded between fibrous layers	Intact	None

sive anterior synechias. It is interesting to note in this connection that the sclera also becomes markedly edematous.

As is well known, the parallel arrangement of corneal lamellae is essential to transparency, and a pathologic process that interferes with this arrangement will impair transparency. Cellular infiltration due to infection, vascularization, increased intraocular pressure, and synechias, will all prejudice the transparency of the graft. If the graft tissue is unacceptable to the host, the stroma will be replaced by fibrous tissue, which will not have the regular parallel arrangement. This fibrous tissue tends to form beneath the epithelium and in front of the endothelium.

The reaction of the stroma to suture material is illustrated and consists of partial encapsulation with giant cells and the ingrowth of connective-tissue cells.

At the margin of the graft, keratoblasts grow in to heal the graft in position and these tend to form a parallel arrangement, so

that histologically the line of demarcation is hard to see in perfectly transparent grafts. Fibroblasts or keratoblasts are found at the junction long after the wound has apparently healed.

Synechias have a deleterious effect on the graft. If complete, they cause secondary glaucoma; if incomplete, they leave pigment deposits in the healing margin of the graft. They also serve as the origin for vascularization and scar-tissue formation. In marked cases they form the basis for granulation tissue.

Descemet's membrane. This membrane is well developed in rabbits and has a tendency to be regenerated, presumably by the endothelium. In the case of a perfectly fitting graft, Descemet's membrane can heal end to end, otherwise it tends to have several brush-like or Y-shaped extensions. In the grafts that degenerate or are replaced by fibrous tissue, Descemet's membrane can be seen usually in coiled or wrinkled state and is the last structure to be absorbed.

Endothelium. This layer covers the internal surface in all instances and is probably derived from the host. We have no definite knowledge as to the fate of the endothelium of the graft except that injury to the endothelium will increase the amount of postoperative edema. In some instances, the endothelial proliferation produces cystlike formations.

General discussion

We have learned several important factors in corneal transplantation from our study and we are able to infer others. In order for a corneal graft to remain clear and heal properly, it must be obtained from fresh viable cornea of the same species. The occasional reports that clear grafts have been obtained from transplantations of variously preserved corneas or from other species of animals are probably the result of laying down of fibrous tissue by the host cornea in parallel arrangement during the healing process. The epithelium and probably the endothelium are replaced in the graft by the appropriate cell layers from the host. The healing that takes place at the stromal level involves the ingrowth of a great number of fibroblasts or keratoblasts from the host. We are not sure as to the fate of the stroma cells in the central part of the graft. But in view of the fact that bodily tissue cells are normally replaced from time to time in the course of their metabolism, we believe that this also occurs in the cornea and that, over a period of years, the stromal cells replace the donor cells so that eventually the host takes over. However, the graft must be performed under such circumstances that it is surrounded by a sufficient number of normal corneal cells, and the transplanted cornea must be sufficiently viable so that a large proportion of its structure does not need to be replaced rapidly. When rapid replacement occurs the resultant membrane is translucent or opaque and often blood vessels find their way through the surrounding cornea to the site of the graft. Thus, our frozen and dehydrated grafts were sufficiently acceptable to remain in place and allow rapid replacement, but the latter process rendered the grafts opaque.

Anterior synechias are very prejudicial to the success of the graft. They form the basis for vascularization, fibrosis, glaucoma, and iridocyclitis. Uveitis is very much more prone to occur in human grafts, where the eye is not normal to begin with, than it is in the rabbit. Anterior synechias can be avoided by careful coaptation of the wound margins and through thorough dilatation of the pupil.

We really do not agree entirely with either extreme point of view as to the biologic process taking place in corneal transplantation. From the preceding discussion, it can be seen that our views agree in part with each. It is not necessary to regard one theory as completely exclusive of the other.

SUMMARY AND CONCLUSIONS

The literature on the histology of corneal transplantation, both human and experimental, is summarized, together with a discussion of the evidence in favor of true healing versus replacement of the graft.

Our experimental studies are presented, with sections showing normal healing as well as operative complications. Since corneal tissue is unique in its properties of transplantability, considerable emphasis is placed on this phase.

The authors believe that, in successful cases, the cellular elements of the transplant are replaced by the host, and that the intercellular structures of the graft are accepted and persist.

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REFERENCES

1. Artiemiev, H. T.: The subconjunctival implantation of refrigerated cornea in the treatment of keratitis. Vestnik Ophth., **18**:384 (pt. 4) 1941. (Abstract, A. J. Ophth., **25**:240, 1942).
2. Ascher: Problem of keratoplasty. v. Graefe's Arch. f. Ophth., **99**:339, 1919.
3. Babel, Jean: Le sort des greffons corneens transplantes. Ophthalmologica, **109**:1-18, 1945.
4. Bajenova, M. A.: Culture of preserved corneal tissue. Arch. d'Ophth., **53**:300, 1936. (Abstract, Arch. of Ophth., **19**:133, 1938).
5. Bashoff, P. H.: The results of corneal transplantation and plastic operation. S. Africa Med. J., **19**:(June) 1945. (Abstract, A. J. Ophth., **29**:254, 1946).
6. Berezinskaja, D. I.: Corneal transplantation in corneal burns of the eyeball. Vestnik Oft., **20**:19 (pts. 1-2) 1942. (Abstract, A. J. Ophth., **27**:921, 1944).
7. Bonnefon and Lacoste: Quoted by Castroviejo.
8. Castroviejo, Ramon: A historical and experimental study of keratoplasty, including a new method: Part I. A. J. Ophth., **15**:825, 1932; Part II. A. J. Ophth., **15**:905, 1932.
9. ———: Keratoplasty, microscopic study of the corneal grafts. Trans. A. Ophth. Soc., **35**:355, 1937.
10. Chechik-Kunina, E. A. Keratoplasty in serpiginous and purulent corneal ulcers. Vestnik Oft., **20**:30 (pts. 1-2) 1942. (Abstract, A. J. Ophth., **27**:921, 1944).
11. Davis, F. A.: The anatomy of the eye and orbit of the rabbit. Trans. Am. Ophth. Soc., 1929.
12. Deutman, A. F.: Formalinized cornea and keratoplasty in rabbit's eyes. Ophthalmologica, **99**: 418-422, 1940.
13. Duke-Elder: Textbook Ophthalmology. London, Henry Kimpton, v. 2, p. 1847.
14. Elschnig: Keratoplasty. Arch. of Ophth., **4**:165-173, 1930.
15. Felman, P. B.: Soviet Vest. n. Oftalm., **7**:483-486, 1935. (Abstract, A. J. Ophth., **19**: 436, 1936.)
16. Fieandt, Olaf: A histologically examined case of corneal transplantation. Acta. Ophthal., **22**: 36-43 (pt. 1) 1944. (Abstract, A. J. Ophth., **29**:1350, 1946).
17. Filatov: Remarks concerning the amelioration of leukomas and corneal transplantation. Vestnik Oft., **10**:635 (pt. 5) 1937. (Abstract, A. J. Ophth., **20**:1238, 1937).
18. Filatov, V. P., and Bajenova, M. A.: Culture of dried corneal tissue. Arch. d'Ophth. and Rev. Gen. d'Ophth., **1**:385 (May) 1937. (Abstract, A. J. Ophth., **20**:1283, 1937).
19. Filatov, V. P.: Transplantation of the cornea. Arch. of Ophth., **13**:321, 1935.
20. Forster, A. A.: A review of keratoplastic surgery and some experimentations in keratoplasty. A. J. Ophth., **6**:366-375, 1923.
21. Frieberg, T.: Experience with optical keratoplasty in man. Acta Ophth., **5**:122-136 (1) 1927.
22. Fuchs: (Cited from Salzer). Ztschr. f. Augenh., 1901.
23. Imre, Josef: Clinical and histologic experimentation with corneal grafts. Klin. M. f. Augenh., Supplement **14**:50, 1942. (Abstract, A. J. Ophth., **29**:111, 1946).
24. Katzin, H. M.: Aqueous fibrin fixation of corneal transplants in the rabbit. Arch. of Ophth., **35**:415-420, 1946.
25. ———: Animal operating equipment for experimental ocular surgery. Arch. of Ophth., **36**: 215-219, 1946.
26. ———: Contributions to the technic of corneal grafting. Arch. of Ophth., **37**:379, 1947.
27. Kiyama: Experimental keratoplasty. Acta. Soc. Ophth. Jap., **38**:64, 1934. (Abstract, Arch. of Ophth., **13**:1094, 1935).
28. Loehlein, Walter: Progress in corneal transplantation. Arch. of Ophth., **23**:423, 1940.
29. Ribbert: (Cited by Salzer) Experimentelle Erzeugung von Epithelzysten. Deut. Ztschr. f. Chirg., 47.
30. Salzer: Experimentelle Beitraege zur Keratoplastikfrage. Heidelberg, Bericht, 1908, p. 227.
31. ———: Ueber die Regeneration der Hornhaut. Heidelberg, Bericht, 1910, p. 244.

32. ———: Dauhereinheilung von konservierten Hornhautsteuckchen in die Hornhaut des Kaninchens. 36, Heidelberg, Bericht, 1910, p. 312.
33. ———: Beitraege zur Keratoplastik: IV. Implantation ueberlebender Lappen. Graefe's Arch. f. Ophth., **105**:469, 1921.
34. ———: Contributions to keratoplasty: V. The biology of corneal transplantations. Arch. f. Augenh., **110**:450, 1937.
35. ———: How do corneal defects become regenerated? Klin. M. f. Augenh., **107**:389-404. (Oct.) 1941. (Abstract, A. J. Ophth., **29**:112, 1946).
36. Scherschewskaya, O. J.: Keratoplastic experiments with formalinized transplants. Ophthalmogica, **99**:4, 1940. (Abstract, A. J. Ophth., **23**:954, 1940).
37. Sena, J. A., and Jorg, M. E.: Experimental keratoplasty. Arch. de Oftal. de Buenos Aires, **16**:495, 1941. (Abstract, Arch. of Ophth., **29**:148, 1943).
38. Sommer: Zur Histologie der keratoplastik. Arch. f. Ophth., **115**:620, 1925.
39. Thomas, T. W. Tudor: 3. Experimental transplantation of cornea in a central corneal opacity. Trans. Ophth. Soc. U. K., **51**:88-95, 1931.
40. ———: 4. Three corneal grafts in rabbits illustrating the effect of an adherent iris. Trans. Ophth. Soc. U. K., **51**:96-102, 1931.
41. ———: Experimental grafts of devitalized corneal tissue. Trans. Ophth. Soc. U. K., **54**:119, 1934.
42. ———: The clinical record and histology of two successful corneal grafts in man. Trans. Ophth. Soc. U. K., **55**:114, 1935.
43. ———: Experimental heterogeneous corneal grafts. Trans. Ophth. Soc. U. K., **56**:97-120, 1936.
44. Velter, C. L.: Pathologic anatomy of human corneal transplant. Vestnik Ophth., **17**:3 (pts. 1-2) 1940. (Abstract, A. J. Ophth., **24**:594, 1941).
45. Von Hippel: Quoted by Castroviejo. A. J. Ophth., **15**:825 and 905 (Sept. and Oct.) 1932.
46. Wiener, M., and Rosenbaum, H. D.: Formalinized heterogeneous and homogeneous corneal transplantation: Experimental. A. J. Ophth., **24**:1384-1391, 1941.
47. Zirm: (Cited from Salzer). Eineerfolgsreiche total Keratoplastik. Arch. f. Ophth. **64**:3, 1907.

EFFECTS OF PRACTICE AND THE CONSISTENCY OF REPEATED MEASUREMENTS OF ACCOMMODATION AND VERGENCE*

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INTRODUCTION

This laboratory has been interested for some time in the problem of standardization and methodologic evaluation of physiologic procedures and measurements.[1] The knowledge of their variability is essential for the interpretation of the significance of experimentally induced changes. In the clinical practice, the knowledge of the magnitude of "chance" variations in repeated measurements is important from the point of view of the confidence with which we can appraise the presence or absence of functional abnormalities in patients, trends of deterioration or of spontaneous improvement, and the effects of therapy.

Appropriate statistical methods of analysis of the repeatability of the measurements were developed (see Appendix) and analyses of several physiologic functions and biochemical characteristics were made.[2-5] In a recent series of investigations on visual fatigue, several routine ophthalmic methods were used together with other visual tests, the measurements being made before and after the completion of strenuous visual work. The values taken before the start of the work period are suitable for an analysis of the variability of measurements obtained on normal subjects in repeated determinations under well-defined, standard conditions.

In this paper we shall deal only with the ophthalmic tests of accommodation and motor function. There is very little information on the effect of repeated administration of these tests and of the repeatability (consistency) of the scores. This is rather surprising, for one would expect that variations of a method which is used in clinical routine would be known. Obviously, the variability of measurements in normal subjects is important for the interpretation of changes in patients, particularly in the consideration of borderline cases.

METHODS

Measurements were made of accommodation and vergence. Current clinical methods were used.

The accommodation near point was determined by the Prince rule, manufactured by the American Optical Company. The rule was supported on the infraorbital bony rim. The subject was asked to fixate a short line of letters, 0.031 inches in height; at 14 inches the height of these letters corresponds to the size of symbols at the "14/21" line in tests of the acuity for near vision. The letters were printed on dull-white cards, placed in a metal carrier which slides along the rule. The illumination at the level of the card was about 5 foot-candles, about one half of the value recommended by Berens and Zuckerman;[6] the illumination was constant throughout the whole experimental series. The card was brought toward the eye from the range of clear vision to the point at which the letters started to become blurred, and the reading was recorded. Three consecutive measurements were made using the dominant eye; the score is the average of the three determinations and indicates the accommodation near point, in centimeters. The true accommodation near point should be determined as the distance from the anterior focus of the eye, located about 14 mm. in front of the cornea, to the

* This work has been supported in part by a grant from the Verd-A-Ray Corporation, Toledo, Ohio. From the Laboratory of Physiological Hygiene, University of Minnesota.

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point of blurring. The correction is essential when the power of accommodation is expressed in terms of diopters; to compute the latter, the reading (in cm.) obtained on the rule is corrected for the distance of the anterior focal point from the cornea and divided into 100.

The convergence near point was also obtained by the Prince rule, this time held against the bridge of the nose, in midplane. A white circular target, 2 mm. in diameter, taken from a Berens perimetry set, was brought in from the distance of clear vision to the point of binocular diplopia. The distance, in millimeters, from the bridge of the nose to the point at which the break in fixation occurred, served as a score. Three consecutive readings were made and averaged.

Values for abduction (prism divergence), adduction (prism convergence), and positive vertical divergence (prism supravergence) were obtained by the Risley rotating prism, held in front of one eye, while the subject was fixating with both eyes a spot of light six meters distant. The prism strength was increased until the "breaking point" was reached at which the light spot was seen double. A strain was imposed in the direction of abduction, adduction, and positive vertical divergence. The instrument readings were recorded in prism diopters. Each measurement was obtained in triplicate; the score is the average of the three successive determinations.

Subjects

The subjects were six men in the age group of 20 to 30 years, who had served in the laboratory for the year preceding the visual research as full-time experimental subjects in nutritional investigations. They were physically normal, intelligent, and coöperative, with no significant ophthalmic defects, well accustomed and adjusted to the routine of laboratory work and testing.

The visual characteristics (table 1) were well within the normal range, except for the accommodation near point.

TABLE 1

Characterization of the group at the start of the experimental work

Function	Subject Number						Mean	Standard Deviation	Normal Average	Normal Range	Desirable Values
	1	2	3	4	5	6					
Abduction, in diopters	4.3	8.0	5.7	10.0	5.3	5.3	6.43	2.14	6	3 to 8	High
Adduction, in diopters	7.7	5.3	15.7	18.3	16.3	10.0	12.22	5.28	12	(6 to 16)	High
Vertical divergence, in diopters	2.7	2.8	2.7	3.0	2.0	2.3	2.58	0.37	2.5		High
Accommodation near point, in diopters	6.9	6.8	8.4	9.3	6.8	9.9	8.02	1.39	(10.5)	(8.3 to 12.6)	High
Convergence near point, in centimeters	7.7	6.7	4.8	6.3	2.0	6.2	5.62	2.00	6.4	up to 8.0	Low

N =6 subjects, average age 23 years; range, 22 to 25 years. The "normal" values were obtained directly or by interpolation from Berens.[6]

The average accommodation value for the group is eight diopters which is near the subnormal range for the age group. In Duane's table the average-normal value of accommodation for 23 years of age is 10.5D., with the normal-minimum at 8.3D. Following Berens's statement that accommodation may be considered normal if it is not more than 3D. below the mean for the subject's age,[6] we arrive at 7.5 D. as the lower limit of normality.

The value is affected by a number of factors, environmental (illumination intensity on the test object), technical (speed at which the test object approaches the eyes), and subjective (criterion of blurring). The somewhat lower illumination level and the fact that the subjects were encouraged to report the very first sign of blurring may well be the major reasons for the low accommodation values in subjects whose ocu-

lar equipment was clinically considered as a "good normal."

Effects of practice

In a number of variables used in testing different aspects of "fitness" in man the repeated performance leads to an improvement in the test scores. Such an improvement represents an effect of "practice." Practice consists of small modifications in the "work method" of the subject and, in tests involving discrimination, a change in the sensory criterion of identity or difference. Practice does not necessarily bring about an "improvement" in performance but simply a change in the score, not related to any organic, physiologic, or structural alterations. Practice should not be confused with "training" in which a true increase in the functional capacity takes place.

The factor of practice, when present to a significant degree, considerably complicates the experimental design in which provision has to be made for an adequate and sometimes prolonged practice period. The test scores have to be brought up to a relatively stable practice plateau before the start of the experiment proper or other measures of control must be provided. In patients, the practice effects may produce an erroneous impression of improvement.

What is the effect of practice on the ophthalmic tests described above? The tests were administered before and after two hours of strenuous visual work, in a series of 18 testing sessions, with three testing days per week. The effects of practice on the prework test scores will be studied by comparing the means of Trials 1 through 3 with the mean of Trials 4 through 6, and 16 through 18. The individual scores obtained in the testing sessions compared will be considered as paired variates, Y′ and Y″.

TABLE 2

Average scores of the first, second, and sixth set of three successive testing sessions; the mean differences ($\bar{d}$); and the F tests of their statistical significance

Function	Means			Differences		F-tests	
	1st Set	2nd Set	6th Set	2nd vs. 1st	6th vs. 1st	2nd vs. 1st	6th vs. 1st
Abduction, in diopters	5.81	5.40	5.02	−0.41	−0.79	0.70	2.86
Adduction, in diopters	14.96	15.60	12.55	+0.64	−2.31	0.21	2.34
Vertical divergence, in diopters	2.68	2.70	2.50	+0.02	−0.18	0.04	1.33
Accommodation near point, in diopters	7.94	8.14	7.93	+0.20	−0.01	0.58	0.00
Convergence near point, in centimeters	5.43	4.51	3.75	−0.92	−1.68	8.10*	17.35**

For 1 and (18−1)=17 degrees of freedom, the value of the F ratio at the 5% level of significance is 4.45, at the 1% level it is 8.40. The level of significance has been indicated by one and two asterisks, respectively.

With six subjects, each tested on three days in each series, we have 18 values of d, defined as the difference between the paired values, d = Y″ − Y′. The F-test of the statistical significance of the mean difference, d, can be expressed in a simple form:

$$F = \frac{(\sum d)^2/n}{\frac{\sum d^2 - (\sum d)^2/n}{n-1}}$$

where n is the number of differences.

The mean differences—that is, the differences between the average scores obtained in the three sets of testing sessions—and the F test of their statistical significance are given in Table 2.

All changes accompanying repeated administrations of the tests are slight and have no statistical significance except for the change of the convergence near point

which shows a significant improvement on 4th, 5th, and 6th testing; this trend is even more marked in the 16th, 17th, and 18th testing session.

Consistency of repeated measurements

When a test has been repeated under standard conditions on a group of n individuals, I, in a series of k testing trials, D, the consistency of the measurements can be characterized in terms of:

1. The amount of the *intraindividual variation,* measured as $S.D._{wI}$, the average *standard deviation* of the scores *within individuals.* It should be noted that the use of $S.D._{wI}$ for characterizations of the repeatability of a measurement is legitimate only when the mean scores of a group of subjects, tested in a series of repeated testing trials, do not show a systematic trend.

2. The magnitude of the *random variation,* expressed either in the form of the *standard deviation* of the *random* components of the scores, $S.D._R$, or of a *consistency* coefficient, r_C. Neither the $S.D._R$ nor the r_C are affected by the changes in the trial means of the group as a whole.

The derivation of these concepts and the computational formulas are given in the Appendix.

The two types of criteria of consistency, the $S.D._{wI}$ and the $S.D._R$ on the one hand, and the consistency coefficient, r_C, on the other hand, have each some advantages and some limitations.

The concept of intraindividual variation may be readily understood and the term $S.D._{wI}$ indicates the magnitude of the variation in the repeated measurements directly, in terms of the units used in the test. However, the $S.D._{wI}$ values are, as a rule, not commensurable from test to test and do not yield a criterion in terms of which the consistency of different tests could be compared. The evaluation of a given absolute value of $S.D._{wI}$ as a criterion of consistency remains, therefore, impressionistic and the validity of the judgment depends on the breadth of clinical and research experience of the experimenter who is making such a judgment. He actually compares the obtained value with an impression obtained from measuring a large number of subjects and evaluates the given magnitude of the "error of measurement" in reference to the range of "normal" variation or to the differences between "normal" subjects and patients.

The use of the standard deviation of the random components of the scores, $S.D._R$, is subject to similar limitations. It is not a value in terms of which different tests can be directly compared. It becomes much more useful when related to the amount of interindividual variation, measured as the "variance within days" (Appendix, Formula 7).

From this is a short step to the second type of a criterion of consistency, r_C; this modified coefficient of intraclass correlation is an index which may be used directly for comparison of different tests and is closely related to the ordinary product-moment coefficient of correlation computed when only two repeated trials are available. The term r_C depends on two factors (Appendix, Formula 8): (1) the variation between individuals (reflected in V_{wD}) and the random variation (indicated by V_R). In the present experiment, efforts were made in advance to secure a highly homogeneous group of "normal" subjects. Thus the variation between individuals has been decreased and the obtained r_C values are underestimates of the consistency which could be expected in a relatively unselected group of subjects, particularly if patients would be included in the sample.

For the purpose of evaluating the consistency of the battery of ophthalmic measurements on repetition we shall use a set of data obtained in the third series of testing sessions, each series consisting of six trials. At this time the technique of the experimenters and the manner of response of the subjects can be considered as ideally stabilized, and the analysis should be expected

TABLE 3

MEASUREMENTS OBTAINED ON REPETITION IN SIX TESTING SESSIONS IN TRAINED SUBJECTS

A. ACCOMMODATION NEAR POINT, IN DIOPTERS

Subjects								$\bar{Y}_I$
	H	6.6	7.8	6.3	7.4	7.6	7.5	7.2
	R	7.9	7.9	7.9	8.5	9.0	8.6	8.3
	O	8.6	9.0	9.2	7.9	11.0	9.6	9.2
	P	7.4	7.4	6.9	7.2	7.6	7.4	7.3
	B	7.4	7.9	6.8	6.8	7.6	7.4	7.3
	V	9.0	7.9	7.6	7.5	9.0	7.2	8.0
	$\bar{Y}_D$	7.8	8.0	7.4	7.5	8.6	7.9	

B. CONVERGENCE NEAR POINT, IN CENTIMETERS

Subjects								$\bar{Y}_I$
	H	5.5	5.0	5.2	5.8	5.5	4.5	5.2
	R	5.0	4.0	3.5	3.7	4.7	3.5	4.1
	O	2.0	2.0	2.0	2.0	2.0	2.0	2.0
	P	7.5	5.7	5.5	5.0	5.0	3.3	5.3
	B	3.8	3.5	3.0	3.3	3.5	3.0	3.4
	V	4.5	4.0	3.7	2.8	5.5	2.5	3.8
	$\bar{Y}_D$	4.7	4.0	3.8	3.8	4.4	3.1	

C. ABDUCTION, IN DIOPTERS

Subjects								$\bar{Y}_I$
	H	3.0	3.3	4.3	3.0	3.0	3.3	3.3
	R	5.0	5.3	8.0	6.7	5.0	6.3	6.0
	O	5.0	4.3	5.3	6.3	6.0	7.0	5.6
	P	5.3	5.7	6.7	5.3	4.7	6.0	5.6
	B	4.0	5.3	5.3	4.0	5.0	5.3	4.8
	V	4.0	5.0	3.7	6.0	3.0	4.3	4.3
	$\bar{Y}_D$	4.4	4.8	5.6	5.2	4.4	5.4	

D. ADDUCTION, IN DIOPTERS

Subjects								$\bar{Y}_I$
	H	4.7	5.3	7.0	5.3	4.0	6.0	5.4
	R	9.0	9.7	9.0	9.7	7.3	7.3	8.7
	O	20.7	30.0	30.0	20.3	14.7	30.0	24.3
	P	9.3	19.0	14.7	19.7	11.3	14.3	14.7
	B	15.3	14.0	14.0	11.7	15.3	15.7	14.3
	V	10.0	17.0	12.7	12.7	10.0	12.3	12.4
	$\bar{Y}_D$	11.5	15.8	14.6	13.2	10.4	14.3	

E. POSITIVE VERTICAL DIVERGENCE

Subjects								$\bar{Y}_I$
	H	2.0	2.0	2.0	2.0	2.2	2.0	2.0
	R	2.3	2.0	2.5	2.0	2.3	2.5	2.3
	O	2.5	2.8	3.0	2.5	3.0	2.8	2.8
	P	3.0	3.0	3.0	3.5	2.5	3.0	3.0
	B	2.0	2.0	3.0	2.0	2.5	2.3	2.3
	V	2.0	2.2	2.8	2.5	2.5	3.0	2.5
	$\bar{Y}_D$	2.3	2.3	2.7	2.4	2.5	2.6	

to yield the highest measure of consistency obtainable under standard conditions of over-all physical fitness, nutritional status, activity, and illumination. The interval between test sessions was 2 to 3 days. The original data are given in Table 3, A to E. Variances basic to the evaluation of consistency of repeated measurements are presented in Table 4, the consistency criteria in Table 5.

In terms of $S.D._{wI}$, the tests on repetition appear to yield values of acceptable consistency; that is, the intraindividual variability is relatively small as compared to the extent of the normal range and, more importantly, to the differences between normals and patients. Sometimes efforts are made to provide a criterion suitable for comparing the consistency of different tests by expressing $S.D._{wI}$ as percentage of the grand mean of the n.k scores. This is a hazardous procedure and the figures in Table

TABLE 4

VARIANCES BASIC TO EVALUATION OF CONSISTENCY OF REPEATED MEASUREMENTS

Function	V_{wI}	V_R	V_{wD}
Abduction	0.77	0.63	1.57
Adduction	11.90	9.40	49.60
Vertical divergence	0.08	0.07	0.18
Accommodation near point	0.42	0.30	1.25
Convergence near point	0.60	0.40	1.90

V_{wI} = variance between daily scores within individuals; V_R = random variance; V_{wD} = variance between individual scores within days.

SUMMARY

1. Measurements of ocular accommodation and vergence were made in six subjects under standard conditions.

2. The measurements were repeated at intervals of 2 to 3 days in a series of 18 testing sessions.

3. Two preliminary trials were sufficient in the majority of the routine ophthalmic tests used to stabilize the scores at a plateau.

4. The measurements provide reasonably

TABLE 5

CONSISTENCY OF REPEATED MEASUREMENTS. ABSOLUTE VALUES OF $S.D._{wI}$ AS AN INDEX OF DAY-TO-DAY VARIABILITY; $S.D._{wI}$ EXPRESSED AS PERCENTAGE OF THE MEAN ($\bar{Y}$); AND r_C, THE COEFFICIENT OF CONSISTENCY

Function	Mean ($\bar{Y}$)	$S.D._{wI}$	$\frac{S.D._{wI} \times 100}{\bar{Y}}$	r_C
Abduction	4.96 D.	0.88 D.	17.8%	0.60
Adduction	13.30 D.	3.45 D.	25.9%	0.81
Vertical divergence	2.48 D.	0.28 D.	11.3%	0.61
Accommodation near point	7.90 D.	0.65 D.	8.2%	0.76
Convergence near point	3.97 mm.	0.78 mm.	19.6%	0.79

3 should be accepted with reservation and interpreted with caution.

The r_C values vary from 0.60 to 0.81; in a reasonably heterogeneous group of subjects, values of r_C below 0.70 would be regarded as indicating a low consistency of the scores on repeated testing, $0.71 \leqq r_C \leqq 0.80$ would be interpreted as an index of moderately high consistency. Thus in the present test battery only the measurements of adduction, accommodation near point, and convergence near point appear to have the desired degree of reliability on repeated testing. However, it should be realized that the interindividual variability in our group was small; the r_C values are spuriously low. For a definite judgement as to the consistency of these tests similar investigations should be carried out on larger samples and on clinical material.

constant characteristics of the individual subjects.

STATISTICAL APPENDIX

The day-to-day variation in the scores of a group of n individuals tested on k days can be expressed as the average *standard deviation of the scores within individuals:*

$$(1) \qquad S.D._{wI} = \sqrt{\frac{\sum_{1}^{n} \frac{\sum_{1}^{k} (Y_I - \bar{Y}_I)^2}{k-1}}{n}}$$

We obtain the variances of the scores of each individual,

$$\frac{\sum_{1}^{k} (Y_I - \bar{Y}_I)^2}{k-1},$$

where Y_I is a score of an individual, I, on

a given trial, $\bar{Y}_I$ the mean of his scores on the k trials, D; we sum the intraindividual variances for all n individuals, average for an individual by dividing the numerator through n, and take the square root.*

Under certain conditions there may be present a continuous trend in the average scores obtained by a group of subjects in successive trials, resulting from a continued practice. In other situations, there may be significant shifts in the level of the mean score resulting from factors which affect the group as a whole; for example, change in environmental illumination. In such cases the value $S.D._{wI}$ will be large and would yield an underestimate of the reliability of the given test method.

The effect of "trend," both continuous and reflected in the shifts of the group means, is removed when we use the second criterion of consistency of repeated measurement, the random variance, V_R. If $\bar{Y}_I$ = mean of the k scores for a given individual, $\bar{Y}_D$ = mean of the n scores for a given day (or trial), $\bar{Y}$ = the grand mean of the n.k scores, then the *expected value* ($\hat{Y}$) of the score for a given individual and day will be obtained as follows:[7]

$$(2) \qquad Y = \bar{Y} + (\bar{Y}_I - \bar{Y}) + (\bar{Y}_D - \bar{Y})$$

The grand mean, ($\bar{Y}$), indicating the general level of the scores, is adjusted for the average level of the scores of the given individual by adding the component ($\bar{Y}_I - \bar{Y}$) and for the average level of the scores on a given day by adding the component ($\bar{Y}_D - \bar{Y}$).

The actual score (Y) may then be regarded as a sum of the expected score ($\hat{Y}$) and a random component (R):

$$(3) \qquad Y = \hat{Y} + R$$

Therefore,

$$(4) \qquad R = Y - \hat{Y}$$

Substituting for Y from Equation 2 we obtain:

$$(4a) \qquad R = Y - [\bar{Y} + (\bar{Y}_I - \bar{Y}) + (\bar{Y}_D - \bar{Y})]$$

After removing the brackets

$$(4b) \qquad R = Y - \bar{Y} - (\bar{Y}_I - \bar{Y}) - (\bar{Y}_D - \bar{Y})$$

In a table of n.k scores, there are (n-1)(k-1) independent estimates of R, as both the individual and trial means were used in computing the R values; (k-1)(n-1) is the number of the "degrees of freedom" which will be used as denominator in computing V_R.

The *random variance* is then defined as:

$$(5) \qquad V_R = \frac{\sum_1^{nk} R^2}{(n-1)(k-1)}$$

$$(5a) \qquad V_R = \frac{\sum_1^{nk} [Y - \bar{Y} - (\bar{Y}_I - \bar{Y}) - (\bar{Y}_D - \bar{Y})]^2}{(n-1)(k-1)}$$

In order to evaluate the magnitude of V_R we compare it with the differences between individuals. Ideally we should like to use the variance (= standard deviation squared) of the scores in a large, representative sample of individuals for whom the test will be used. Such a variance value is a stable characteristic of each test and would provide a criterion in terms of which different tests could be legitimately compared. Unfortunately this datum is known only for a very few physiologic functions.

Our best substitute is the value V_{wD}, the *"within days" variance,* which represents the interindividual variance obtained for each day (or trial) and averaged:

$$(6) \qquad V_{wD} = \frac{\sum_1^k \frac{\sum_1^n (Y_D - \bar{Y}_D)^2}{n-1}}{k}$$

We obtain the variances of the scores on each of the k days,

$$\frac{\sum_1^n (Y_D - \bar{Y}_D)^2}{n-1},$$

* In this and other cases the standard deviation is obtained as the square root of the sample variance, thus $S.D._{wI} = \sqrt{V_{wI}}$ and $S.D._R = \sqrt{V_R}$.

where Y_D is an individual score on a given day, $\overline{Y}_D$ the mean of the scores of the n individuals measured on that day; sum for all k trials, and average for a trial by dividing by k.

In evaluating the magnitude of the random variance, V_R, we may express it as the percentage of V_{wD}

$$V_R\% = \frac{V_R}{V_{wD}} \times 100 \tag{7}$$

Also we may express it in a form of a consistency coefficient

$$r_C = 1 - \frac{V_R}{V_{wD}} \tag{8}$$

Equation 8 may be written also as

$$r_C = \frac{V_{wD} - V_R}{V_{wD}} \tag{8a}$$

It is evident that when $V_R = O$, $r_C = 1.0$; the closer V_R approaches the value of V_{wD}, the closer r_C approaches zero.

For a rapid computation of the values needed for the characterization of the reliability of a test we may apply formulas which use the scores directly, without computing the deviations from the grand mean. The formulas 1, 6, and 8 may be written as follows:

$$S.D._{wI} = \sqrt{\frac{\sum_1^{nk}(Y^2) - \frac{\sum_1^{n}(T_I^2)}{k}}{n(k-1)}} \tag{9}$$

$$V_{wD} = \frac{\sum_1^{nk}(Y^2) - \frac{\sum_1^{k}(T_D^2)}{n}}{k(n-1)} \tag{10}$$

$$V_R = \frac{\sum_1^{nk}(Y^2) - \frac{\sum_1^{n}(T_I^2)}{k} - \frac{\sum_1^{k}(T_D^2)}{n} + \frac{(GT^2)}{nk}}{(n-1)\quad(k-1)} \tag{11}$$

where Y = any score, n = number of individuals, k = number of days (trials), $T_I = \sum_1^k Y_I$ = total for an individual, $T_D = \sum_1^n Y_D$ = total for a day, $GT = \sum_1^{nk} Y$ = grand total.

Stadium South Tower (14).

References

1. Taylor, H. L., and Brozek, J.: Evaluation of fitness. Fed. Proc., 3:216-222, 1944.
2. Brozek, J., Guetzkow, H., Mickelsen, O., and Keys, A.: Motor performance of normal young men maintained on restricted intakes of vitamin B complex. J. Appl. Psychol., 30:359-379, 1946.
3. Erickson, L., Simonson, E., Taylor, H. L., Alexander, H., and Keys, A.: The energy cost of horizontal and grade walking on the motor-driven treadmill. Am. J. Physiol., 145:391-401, 1946.
4. Simonson, E., Alexander, H., Henschel, A., and Keys, A.: The effect of meals on the electrocardiogram in normal subjects. Am. Heart J., 32:202-214, 1946.
5. Mickelsen, O., Caster, W. O., and Keys, A.: A statistical evaluation of the thiamine and pyramin excretions of normal young men on controlled intakes of thiamine. J. Biol. Chem., 168:415-431, 1947.
6. Berens, C., and Zuckerman, J.: Diagnostic Examination of the Eye. Philadelphia, J. B. Lippincott, 1946, p. 178.
7. Snedecor, G. E.: Statistical methods. Ames, Iowa, Iowa State College Press, XVI, 485 pp., 1946.

NOTES ON THE HISTORY OF OPHTHALMOLOGY IN CANADA*

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Montreal, Quebec

Colonial medical history

A glimpse into the early medical history of Canada is, I think, important before entering into the history of ophthalmology which did not exist as a specialty until many years later. According to Freedman,[1] in a recent paper on "The History of Medical Licensure in Canada," the early medical practice in Canada, under the French régime, was influenced by the medical practice in France, where all trades were controlled by guilds and membership in a guild was a certificate of competency. Surgery was controlled by the barber surgeons. They did traumatic surgery but most of their work consisted of blood-letting, and of opening boils and abscesses. Medicine was practiced by physicians who were graduates of medical schools and were licensed by examination.

A few surgeons came to Canada with the French military forces. Colonists had to be induced to come to Canada, and one of the promises in this inducement was that, if a man came to Canada and followed a trade for 6 or 8 years, he would, on his return to France, be admitted into the guild of the trade or profession he had followed. This resulted in many colonists taking up surgery and the number of charlatans and quacks soon exceeded the number of qualified men. To overcome this deplorable state, the Intendant Bigot, in 1750, passed the first piece of medical legislation in Canada.

The bill enumerated the harmful acts of the charlatans and strangers of unknown ability. Such persons were forbidden to practice under the penalty of a fine with forfeiture of their drugs and instruments, and those who wished to practice medicine were obliged to pass an examination before a representative of the Intendant and the King's Surgeon.

Early medical education

Thirteen years later New France fell to the British and at first, under British rule, there was no control of practice, so that conditions reverted to the old order.

In 1788, however, a medical act was passed in an attempt to relieve chaos in the practice of medicine. This act forbade the practice of unlicensed practitioners under a penalty of 20-pounds fine for the first offense; 50 pounds for the second offense, and 100 pounds and three months in prison for subsequent offenses.

The prerequisites to the study of medicine were examinations in the mother tongue and in Latin. Medical education required a certificate from a recognized university or a five-year apprenticeship with a practicing physician in the province.

Canada was divided into Lower and Upper Canada in 1791. The first legislation affecting the Province of Quebec alone was in 1831, and it is interesting that this act provided for penalties against American practitioners who crossed the border into Canada to see patients.

In 1823, the Montreal Medical Institution was formed by a group of men who taught students in the wards of the Montreal General Hospital, which had opened four years previously. Then, in 1829, the Montreal Medical Institution became the Medical Faculty of McGill University, the first university medical faculty in Canada.

Howard, first ophthalmologist in Canada

It was not until many years later that

* Read at the Centennial Meeting of the Section of Ophthalmology, New York Academy of Medicine, New York, March 17, 1947.

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ophthalmology was practiced as a specialty in Canada, and the first man to limit his practice to it was Henry Howard, M.D., M.R.C.S., London. He was born at Nenagh, Tipperary, Ireland, December 1, 1815, where he was educated.

Dr. Howard studied his profession in Dublin, attending lectures in the College of Surgeons and the University of Trinity College. His early studies in Dublin were under the guidance of one of the most learned and successful European practitioners of ophthalmology—Arthur Jacob, professor of anatomy and physiology in the Royal College of Surgeons of Ireland, and one of the surgeons of the City of Dublin Hospital. Jacob made many contributions to medicine among which was *A Treatise on the Inflammations of the Eyeball,* published in 1849.

After practicing in Dublin and County of Leatrim for a time, Dr. Howard immigrated to Canada in 1841. For a short period he resided on Amherst Island, in Upper Canada, then at Kingston, and finally he took up residence in Montreal. Here, he was offered an opportunity for which he had always longed—to devote his whole time to eye and ear surgery.

Publishes textbook

In the preface to his book on *The Anatomy, Physiology, and Pathology of the Eye,* it is stated that he had for the past four years, as the surgeon to the Montreal Eye and Ear Institution, devoted his labors exclusively to the treatment of disease incident to these organs. This book, published in 1850, by Armour and Ramsay, Montreal, and John Churchill, London, was an octavo of 517 pages. It is a very good textbook for the time, and it is not simply a compilation of work done by previous authors but it also includes his own conclusions based on his studies and practical experience.

From the *Montreal Directory of 1847,* it was learned that the Institution for the Treatment of Diseases of the Eye and Ear, conducted by Surgeon Howard, M.D., and the Rev. W. A. Adamson, secretary and treasurer, was situated in the Hay Market. Subscribers of one pound per annum had the privilege of recommending poor patients to the institution. This institution was separate from Dr. Howard's house; but, in 1849, the address of the institution was 6 St. François Xavier Street, which was also his domicile. This address appears in the foreword of his book.

In 1861, he was appointed medical superintendent of a lunatic asylum at St. Johns, Quebec. The last year in which the Montreal Eye and Ear Institution was listed in the *Montreal Directory* was 1860, and Dr. Howard's name does not appear in the directory thereafter. This would conform to his appointment to the mental hospital.

From here on, as he left the field of ophthalmology, his later life does not concern us, except to mention that his tenure of office was a successful one. When confederation placed the insane under provincial management and the asylum at St. Johns was closed and the patients were moved to St. Jean de Dieu Asylum, near Montreal, Dr. Howard then became government inspector, a position which he held until his death in 1887.

Writings of Dr. Howard

Among many articles written by Dr. Howard was one on "On the Observations on the Curability of Opacities of the Cornea Treated by Prussic-Acid Vapor," a method of treatment suggested by a Dr. Bigger. He mentions six cases cured by this method. The article was published in the *British-American Medical and Surgical Journal, 1846-47.*

In the same journal, in the same year, there was a paper by Howard on "The Physiology of the Muscles of the Eye with Some New Views on Their Action." He emphasized in this paper that the inferior oblique and the superior oblique muscles are involuntary or reflective and that the rectus muscles are voluntary in their action. And in the same journal, same year, is an-

other paper by Dr. Howard on the "Physiology of the Fifth Pair of Nerves, But More Particularly the Ophthalmic Branch." He believed that the effect produced on the eye by belladonna was through its action on the fifth pair of nerves.

In 1850, he reported a case of traumatic cataract in which the lens was absorbed by the aqueous. Outside the subject of ophthalmology, in 1871, he published a pamphlet on a "Treatise on the Howard System of Ventilation." In this it is proposed to "expel foul air as fast as generated and admit pure air as fast without sensible draught on the person." The pamphlet contains 13 pages and at the end, under caution, is the warning that "any person found using one of Howard's expellers or ventilators without the patent stamp being on it would be prosecuted with the full rigor of the law. The prices can be learned from the maker on application." Dr. Howard was a highly esteemed member of the medical profession.

Early 19th century oculist

Perhaps the first well-trained oculist of his time to go to Upper Canada was Dr. Samuel John Stratford, M.R.C.S., London. He was a graduate of St. Georges and Westminster Hospitals in London, and was a pupil of William Charles Bell, and also of Dr. Guthrie at his infirmary. He wrote *A Manual of the Anatomy, Physiology and Diseases of the Eye and Its Appendages,* published in 1828, by Longman and others. It is a work of 190 pages, well written, and although it covers the diseases and their treatment, as well as the anatomy and physiology of the eye, optics and refraction are not included. He was commissioned assistant surgeon in the 72nd Regiment Scotch Highlanders but later he disposed of his commission and came to Canada, and for a time practiced in Bye-Town, now Ottawa, in 1831.

Later, Dr. Stratford moved to Woodstock, Upper Canada, where he remained for 20 years in general practice. In 1868, he went to New Zealand. There is no mention of restriction of his practice to diseases of the eye. He probably was influenced by his father, Dr. John Stratford, who was also an M.R.C.S., London, and who came to Canada in 1833. At Brockville, he issued the following professional card: "Dr. Stratford, Surgeon, Accoucher and Oculist; 30 years a member of the Royal College of Surgeons, London; 20 years in his Majesty's Military Service in that capacity, and many years in extensive private practice. Dr. Stratford has extended his practice to the diseases of females and children with more than ordinary success in their treatment."

Rosebrugh, Toronto ophthalmologist

According to Dr. P. J. F. Houston,[2] Abner M. Rosebrugh was the "Father of Ophthalmology" in Toronto, since he was the first to limit his practice to diseases of the eye and ear. Born in Branchton, in Upper Canada, in 1835, he studied at Rolfe's School of Medicine and started practice at Preston.

Since he had no special training, Dr. Rosebrugh studied first on animals and then decided to go into the specialty. He did postgraduate work in New York and London and started practicing in Toronto, in 1863. He endeavored to get the endorsement of the medical practitioners of the city but it was not unanimous. Nevertheless, his office was soon filled with special cases so that with the help of a few business men an Eye and Ear Hospital was opened on Adelaide Street, where he gave years of service to the poor of Toronto and the surrounding country.

Invents an ophthalmoscope

He was an ingenious man and invented among other things a demonstrating ophthalmoscope and a modification of it by means of which photographs of the fundus could be taken. This was in 1865, and a description of the instrument is included in his course of lectures delivered before the

ophthalmic class of the Toronto School of Medicine. These lectures were published in the *Canadian Medical Journal*, in 1866, under the headings of "The Optical Defects of the Eye and Their Treatment by the Scientific Use of Spectacles," and also "On the Ophthalmoscope." The lectures show that Dr. Rosebrugh had a good knowledge of optics but that refraction at that time consisted of prescribing spheres because he mentions that cylinders were prescribed for astigmatism but he himself had only seen one case of astigmatism.

Early teacher of ophthalmology

In 1867, Dr. Rosebrugh was joined in the practice by his brother-in-law, Dr. Richard Andrew Reeve, who became one of the most outstanding oculists in Canada. Dr. Reeve was born in Toronto, in 1842, was educated at Toronto University, and followed his medical studies at Queen's University, Kingston, being graduated in 1865. He was a demonstrator in anatomy the next year and in chemistry the following year. He then decided to practice ophthalmology and joined Dr. Rosebrugh at the Eye and Ear Infirmary in Toronto.

In 1872, he became ophthalmic and aural surgeon to the Toronto General Hospital, and, in 1887, he was appointed professor of ophthalmology and otology at the University of Toronto, retiring in 1915. He was made dean of the Faculty of Medicine in 1896, and held that position for 12 years. In 1906, he was president of the British Medical Association when that society met in Toronto.

Dr. Reeve was a leader, not alone in his special field but also in medical and university circles. The high regard in which he was held was not only because of his character and dignity but also because of his wide clinical knowledge. In addition to a series of papers and addresses, Dr. Reeve, by his lectures and clinics, did his share in the training of successive generations of medical students.

Dr. Reeve was succeeded in the chair of ophthalmology at Toronto University by Dr. James Metcalfe MacCallum, who held the chair until 1929. Dr. MacCallum in turn was succeeded by Dr. William Lowry and later by Dr. Walter Wright. Many other Toronto oculists contributed their share in the teaching of ophthalmology, and of these, perhaps Dr. George Herbert Burnham and Dr. George Stirling Ryerson should be especially mentioned.

Influence of Desjardins

The first well-trained ophthalmologist among our French-speaking confreres was Dr. Louis Edward Desjardins who was born in 1837, at Terrebonne, Quebec. He was graduated from L'Ecole de Médecine et de Chirurgie de Montréal, in 1864, and after practicing general medicine for seven years went to Europe to specialize in ophthalmology. He worked in London under Bowman and Critchett, and in Paris under de Wecker, Galezowski, de Sichel, and Meyer, and returned to Montreal in 1873. He founded the Nazareth Ophthalmic Institute where he practiced ophthalmology for over 30 years.

In history of Medical Faculty University of Montreal

In 1882, he was named professor of ophthalmology at L'Ecole de Médecine et de Chirurgie de Montréal, and oculist to the Hotel Dieu, where he lectured until his last illness. He played a very important role in the history of L'Ecole de Médecine et de Chirurgie de Montréal, which today is the Medical Faculty of the University of Montreal.

This school originated in 1843, ostensibly to meet the needs of the French-Canadian student public but undoubtedly also as a protest against what was then considered the monopoly of teaching privileges and of appointments at the Montreal General Hospital by those in authority at McGill University.

Its first teachers were all English-speaking. The legislature of the Province of Que-

bec passed an act under which lectures were to be given in French and English and authority was given for certificates to be awarded to its graduates to practice medicine. The latter privilege was cancelled two years later, in 1847, that is 100 years ago this year, on the incorporation of the College of Physicians and Surgeons of the Province of Quebec, which gave licenses only to those holding a university degree. In the emergency, an agreement was reached with McGill University under which all the lectures were to be given at L'Ecole de Médecine et de Chirurgie, in the French language only, and the students who completed this course at this school were to be admitted to the final year at McGill, which would entitle them to a degree from McGill University. This arrangement lasted until 1850.

The school then applied to Laval University in Quebec for affiliation, but this failed and, in 1867, it became affiliated with Victoria University of Cobourg, Ontario, a Protestant institution.

New troubles arose; so, in 1877, Laval University of Quebec came forward with new proposals backed by the Roman Catholic Church. This caused a break-up in the school; some students going to Laval and others continuing with L'Ecole.

During the years, a serious misunderstanding arose which threatened L'Ecole for it found itself barred by the church from attendance at the Hotel Dieu, which was deeply regretted by the nuns, and its members and students were excommunicated on the grounds of disobedience to authority and association with a Protestant university.

The painful situation was saved by the direct intervention of the Pope, before whom matters were laid by Dr. Desjardins in person, representing L'Ecole. He said, "I will go to Rome to obtain justice for L'Ecole even if I have to remain there."

Founds medical journals

Dr. Desjardins was one of the founders of *L'Union Médicale* and some years later of the *Gazette Médicale*. He published a certain number of scientific works on cataract, glaucoma, affections of the lids, and refraction, and he was interested in ocular research among the deaf mutes. He devoted his leisure to music. He was the "Father of Ophthalmology" in French-speaking Montreal.

Among his successors were several very able ophthalmologists, all of whom were trained in France, and all of whom included diseases of the ear, nose, and throat in their practice. Dr. A. A. Foucher,[3] who succeeded him at the University of Montreal and was chief of the department at the Notre Dame Hospital, published a textbook on *Maladies des Yeux et des Oreille*, in 1894. The part on the eye consists of 243 pages. Dr. Rudolfe Boulet and Dr. Albert LaSalle deserve special mention. They were charming men who served long and well, as did Dr. J. N. Roy, who is still living.

Buller, first modern ophthalmologist

Dr. Frank Buller was the first modern ophthalmologist to establish himself in Canada, and the following history of his life is taken from a biography written by Dr. W. Gordon M. Byers.[4]

Dr. Buller's father, who was a descendant of an old Devonshire family, immigrated to America in 1831, and Frank Buller was born near Cobourg, Ontario, in 1844. He was educated in a local school, except for three years when the family moved to Iowa, and at Peterborough, Ontario, where he attended a grammar school.

During the summer months he learned dispensing in the office of Dr. Burnham, a leading practitioner of his day. Dr. Buller was graduated from Rolfe's Medical School in Toronto, in 1868, and after a year of general practice in Michigan, he went to Europe for special work in connection with the eye and ear. He remained there for about seven years. He first went to von Graefe's clinic in Berlin, and although von Graefe died in 1870, Dr. Buller had been in contact with and was inspired by him. During the Franco-Prussian war, Dr. Buller

served as a volunteer assistant in a German military hospital, and at the expiration of the war he returned to Berlin where he worked under Virchow in general pathology, and in physiologic optics under Helmholtz.

House surgeon at Moorfields

In 1872, he went to London, and after passing his examination for membership in the Royal College of Surgeons, he was appointed a house surgeon at the Royal London Ophthalmic (Moorfields) Hospital. Here he was under Bowman, Critchett, and Hutchinson, and worked with Nettleship and Gunn. He had gained a mastery of the ophthalmoscope in Berlin, and from him his English confreres learned the full use of the direct method of examination. During his service here he introduced the protective shield since known as the "Buller's shield." He began practice in Montreal, in 1876. In doing so he was influenced by two Canadians whom he had learned to know in London, Dr. F. J. Sheperd and Dr. William Osler.

Friendship with Osler

It is interesting to know that Osler himself had intended going into eye work and to locate in Montreal. Cushing,[5] in his *Life of Osler*, quotes the correspondence between the dean of McGill medical faculty, Dr. R. Palmer Howard, and Osler. In this the dean informed Osler that there were three candidates in the field with better chances and he advised him to abandon the field of ophthalmology and to cultivate the whole field of medicine and surgery, paying special attention to practical physiology. Osler was disappointed at the blighting of his prospects as an ophthalmic surgeon but accepted the inevitable with good grace.

That there was no ill feeling between Osler and Buller over this incident is shown by the fact that they remained close friends. In fact, Osler had an office in Buller's house on his return to Montreal. One cannot even dare to speculate on what ophthalmology would have gained and general medicine would have lost had Osler's original hopes been realized. But to return to Buller.

Establishes ophthalmic clinic

He was given permission to establish an ophthalmic clinic at the Montreal General Hospital, where at that time the entire clinical teaching of the McGill Medical School was carried on. At first the older men were unwilling to relinquish their ophthalmic cases but, in a short time, Dr. Buller's superior training and knowledge settled the question.

In 1883, he was appointed to the first chair of ophthalmology at McGill University and, in 1895, he resigned his position at the Montreal General Hospital to take charge of the ophthalmic clinic at the new Royal Victoria Hospital, which post he held until his death in 1905.

Dr. Buller was the most outstanding man in our special field in Canada, and his practice extended from one end of the country to the other. He had a good working knowledge of French and a mastery of German so that he kept abreast with the literature on ophthalmology.

In spite of his busy practice he found time to make 76 contributions to the literature. Included in these papers are descriptions of a protective bandage for the eye, an improved trial frame, a double needle for discission of secondary cataract, a temporary ligation of the canaliculi to prevent wound infection in operation of the eye, a modification of the Mule's operation, and skin grafting in ophthalmic surgery.

Stirling succeeds Buller

Dr. Buller's successor to the chair of ophthalmology at McGill University and chief of the ophthalmic department of the Royal Victoria Hospital was Dr. John W. Stirling. Dr. Stirling was a native of Halifax, Nova Scotia, where he received his early education. He was graduated in medicine from the University of Edinburgh in 1884, and afterward was a pupil of Argyll-Robertson. He continued his studies in Vi-

enna, Berlin, and London, and returned to Canada, in 1887, and took up practice in Montreal.

Dr. Stirling was an excellent ophthalmologist, a good teacher, and made many useful contributions to ophthalmic literature. I personally owe much to him as he was my first teacher and chief in ophthalmology. Dr. Stirling was succeeded by Dr. W. Gordon M. Byers, who was followed by Dr. Fred T. Tooke, who in turn was succeeded by the late Dr. S. Hanford McKee, at the university; all three men were outstanding in our special field and all were known personally to many of the men here tonight.

Trachoma in Canada

While in this period of the history of ophthalmology in Canada, I should like to digress and to mention that the scarcity of trachoma in clinical and private practice has always impressed me. Trachoma was a fairly common ocular disease, chiefly at ports of entrance in Canada, about the middle of the 19th century.

Howard in his textbook, in 1850, states that he had cured upward of 200 cases in the previous four years. The disease declined until about 1898, when an organized movement to settle Jews in Canada, increased its incidence. Moreover, in 1897, the United States government declared trachoma to be a menacing disease and closed the Atlantic ports to trachomatous immigrants; but they left the Canadian border open and many cases found entrance to the United States in this way.

To overcome this, in 1901, the United States government kept a close watch on the Canadian border, resulting in a large number of trachoma cases being left in Canada. As a result, in 1902, the Canadian government amended its immigration act to exclude immigrants and visitors suffering from loathsome, dangerous, and infectious diseases. These regulations became increasingly effective until, in 1927, exclusion became absolute. Dr. Gordon Byers took a very active part in obtaining this legislation, and the above information is taken from a paper by him on trachoma.[6] Today, trachoma is an extremely rare disease in Canada, except among some Indian settlements in western Canada.

Training of new generation

I have, of necessity, chosen only a few of the men who played an important role in the development of our specialty in Canada. Many others deserve special mention and in a more comprehensive paper their names would be included.

It is quite apparent that the history of ophthalmology is no more than the history of the lives and accomplishments of the men who practiced it and of the institutions in which their work was done or to which they were attached.

As a general rule, those who have contributed most to the subject are the ones who have had the best preliminary training. In order that the men of the future will obtain good preliminary training, much responsibility is thrown upon the present generation of teachers and practitioners.

Teachers of undergraduate students in medicine should try to make the subject so attractive that many of the students will be impressed and decide upon ophthalmology as their vocation. If they decide early, they can concentrate their studies along these lines and avoid loss of the time spent in indecision. I think the day is past for men to enter the field of ophthalmology through general practice.

Preliminary to medical studies some knowledge of the classics, especially Latin, is essential, and a reading knowledge of at least two modern languages, perhaps French and German, and in the future even Russian or Spanish, is necessary for those who wish to go far in the subject.

Training facilities in Canada

The need for trained ophthalmologists is great, but at the present time such training is not available for all those who apply.

Our training facilities in Canada are

limited because of our small and scattered population. I think the best we can possibly do is to turn out 10 well-trained men each year and this has to be done at university centers.

Until the war, our university training had been limited to undergraduate work where the object was to graduate good general practitioners with a knowledge of diseases of the eye encountered in general practice. A few internes on eye services in hospitals throughout the country, whose duties were limited to eye work only, were carried along for one or perhaps two years and then they continued their training in other centers either in the United States or in Europe. During and since the war, these opportunities for training in centers outside of Canada no longer exist so that we have had, fortunately, to fall back on our own resources.

At McGill University we have started a four years' diploma course—one year of basic studies, two years of internship and one year of research, requiring a thesis. A similar course has just been started in the University of Toronto, where for the first time in Canada a half-time director of ophthalmology has been appointed. In our course at McGill University, the diploma student must spend at least two of his four years with us, the other two may be spent at some other recognized center. This is done to give the student a broader view in his training. I think this is a good plan and I should like to see it become more widespread so that there may be interchange of internes among the various training centers.

I should like particularly to thank Dr. W. W. Francis, librarian, Osler Library, McGill University, and Miss Edith Gordon, medical librarian, McGill University, for their assistance in obtaining much information.

Royal Victoria Hospital.

References

1. Freedman, Newman B.: History of medical licensure in Canada. L'Action Médicale, 23:13 (Jan.) 1947.
2. Houston, P. J. F.: Early ophthalmology in Toronto. Can. Med. Asso. J., 24:708-710, 1931.
3. Foucher, A. A.: Maladies des Yeux, des Oreilles, du Nez et du Pharynx. J. B. Rolland et Fils, 1894.
4. Byers, W. Gordon M.: Frank Buller. Surg. Gyn. & Ob., 40:439-443 (Mar.) 1925.
5. Cushing, Harvey: The Life of Sir William Osler. Oxford, The Clarendon Press, vol. 1, 1925.
6. Byers, W. Gordon M.: Trachoma in Canada. Can. Med. Asso. J., 32:372-376, 1932.

Other Sources from Which Information Was Obtained

Heagerty, J. J.: Four Centuries of Medical History in Canada. Toronto, The Macmillan Co., 1928.

Canniff, William: The Medical Profession in Upper Canada, 1783-1850. Toronto, William Briggs, 1894.

Abbott, Maude E.: History of Medicine in the Province of Quebec. (McGill University). Montreal, The Dominion Publishing Co., Ltd., 1931.

Shepherd, Francis J.: Origin and History of the Montreal General Hospital. Montreal, Gazette Printing Co., Ltd., 1924.

LeSage, Albert: 75e Anniversaire de la Fondation de L'Union Médicale du Canada—1872-1947. Bull. de L'assoc. des Médecins de Langue Française du Canada—L'Union Médicale du Canada. 75: 1272-1273, 1282-1283 (Nov.) 1946.

Collins, E. Treacher: The History and Traditions of the Moorfields Eye Hospital. London, H. K. Lewis & Co., Ltd., 1929.

Information Obtained from Personal Correspondence

Campbell, Dr. Colin A., 321 Medical Arts Building, Toronto 5, Ontario.
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CONCERNING CHOROIDITIS PROLIFERANS*

CHEN YEN, M.D.
Shanghai, China

In his book *Diseases of the Eyeground,* Adalbert Fuchs describes a disease under the name of choroiditis proliferans. This rare disease is characterized by many newly formed strands of connective tissue lying on the inner surface of the choroid over which run retinal vessels. The retina itself is relatively uninvolved. The choroid shows some shifting of pigment. The strands of the connective tissue are characterized by a tendonlike shiny color and delicate stripes. Adalbert Fuchs considers these strands of connective tissue to be the result of exudates occurring chiefly in the choroid. This characteristic picture seems to develop especially after reattachment of a detached retina. Even after reattachment of an ordinary serous retinal detachment, delicate strands of connective tissue seem to form now and then on the inner surface of the choroid. Fuchs shows such strands in Figure 5 of Table 37, and describes it as follows:

"The detached retina of a woman of 20 had reattached after some time spontaneously and, as usual in such cases, the vision was very poor due to the long duration of the detachment. The patient could count fingers at 1½ meters. The area of the reattachment could be recognized clearly because of the sharp demarcation and one could see several thin, branching and very white strands of connective tissue which were lying beneath the retinal vessels. In this case, however, the picture was not dominated by the white stripes but by the pigmentary disturbances which always develop after reattachments."

Recently I saw a similar picture in a young man who was operated successfully for a detached retina.

CASE 1

A short distance from the postoperative scars which could be easily seen as partly black, partly white lesions, a white, straight, delicate strand of connective tissue extended downward from above. Apparently a deposit of fibrin had become organized here.

In rare cases the formation of subretinal strands is so widespread that it dominates the picture, just as the formation of preretinal strands dominates the picture of retinitis proliferans. Such a picture is shown by Adalbert Fuchs in Figure 7 of Table 25, and described as follows:

"A boy of 16, showing a positive Wassermann test, developed a bilateral impairment of vision three years ago. Both fundi presented approximately the same picture. The discs were somewhat pale, the retinal vessels narrow. In addition to some pigment atrophy in several places there were broad, shiny white strands of connective tissue underneath the retina partially encircling the disc and branching in many places with a fringelike ending. In some places these bands had the width of one disc diameter."

Fuchs assumed that choroiditis exudativa interna might precede the formation of this abundant connective-tissue formation. I have had a case in my department, which I am inclined to consider as such an instance of choroiditis proliferans:

CASE 2

History. A merchant, aged 27 years, noted, 10 years ago, failing vision in his right eye which could not be improved with glasses. There was a dustlike shadow before his eye. After three years, the vision became very poor and a Japanese oculist diagnosed a retinal detachment. The left eye was normal at that time, but later became just as poor as the right eye. Three years ago, an oculist diagnosed bilateral detachment of the

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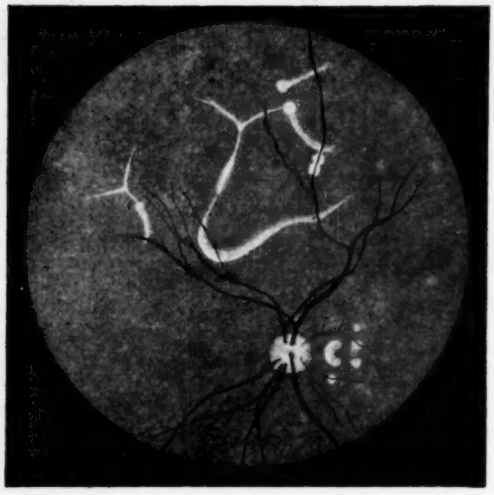

Fig. 1 (Yen). In the right eye, there was a small cataracta polaris anterior. In both eyes, there were numerous shiny, white strands in the neighborhood of the discs and in the peripheries which were crossed by retinal vessels.

retina. The patient did not receive any treatment.

Findings. Wassermann blood test was negative. Right vision was hand movements at one meter; left vision, 1/60. Right visual fields showed remnants, temporal and above; left visual fields were grossly normal.

In the right eye, there was a small cataracta polaris anterior. In both eyes, there were tiny opacities in the vitreous. The fundus findings were similar in the two eyes (figs. 1 and 2). The borders of the discs were sharp and the color normal. The retinal vessels were normal. There were numerous shiny, white strands in the neighborhood of the discs and in the peripheries which were crossed by retinal vessels. These strands were fairly straight with an occasional kneelike curve. In some places the strands originated from a single round spot. In the left eye the connective tissue between macula and disc occupied a large area with a fringelike appearance temporally, while the sharp nasal edge partly encircled the disc.

Comment. As happens so often in China it was very difficult to get an exact history.

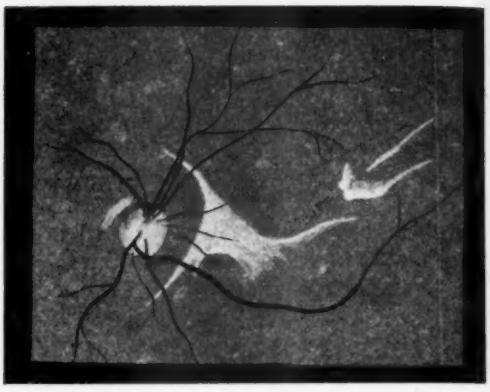

Fig. 2 (Yen). In the left eye, the connective tissue between macula and disc occupied a large area with a fringelike appearance temporally, while the sharp nasal edge partly encircled the disc.

Be that as it is, the result—a bilateral retinal detachment—was before us. The fundus, however, did not present the picture usually seen after reattachment of an ordinary serous detachment. There were no characteristic pigmentary disturbances and no sharp borders. This case was probably one of Harada's disease. This disease, extremely rare in Europe, is characterized by a bilateral detachment of the retina with iridocyclitis. After some time, when the retina reattaches again, the fundus appears depigmented and shows some isolated pigment proliferations. The vision usually improves. The condition is often associated with loss and graying of the hair and with auditory disturbances.

In our case we could not find any evidence of a previous iridocyclitis or of a systemic disease. The history of a bilateral retinal detachment with spontaneous reattachment and the appearance of the fundi suggest strongly the end result of Harada's disease.

CONCLUSION. Choroiditis proliferans seems to be the end result of an exudative, inflammatory detachment of the retina. A hemorrhagic origin can be ruled out almost with certainty. It is a well-defined clinical picture.

Tung-Chi University.

LYMPHOCYTOMA OF THE ORBIT SUCCESSFULLY TREATED BY ROENTGEN IRRADIATION*

Report of a case

Stefan Van Wien, M.D.
Chicago, Illinois

Lymphatic tumors of the orbit are either manifestations of a constitutional involvement of the lymphatic system or an independent local hyperplasia of lymphatic tissue. Although constitutional involvement usually occurs bilaterally, local hyperplasia almost invariably involves one orbit only. Birch-Hirschfeld, in his discussion of localized lymphatic tumors of the orbit, stresses that they comprise a heterogeneous group with transitions from undeniable forms of lymphosarcoma through benign tumors to a peculiar type which he calls "pseudotumor," and which actually are the result of chronic inflammation.

The lymphocytoma of the orbit represents an example of a benign lymphatic tumor. Histologically, it is a homogeneous mass, made up of lymphoid tissue that may show fibrous bands but is void of a well-developed reticulum. Since this condition is not seen too frequently, a brief report on such a case seems justified as an addition to the literature.

Report of case

History. A 67-year-old white woman was seen for the first time on October 31, 1946. She had noted a painless swelling in the region of the left upper lid that had gradually increased in size over a period of three years. At no time was there evidence of inflammation. The patient did not recall enlarged glands or swellings elsewhere on her body. Several ophthalmologists who were consulted advised an expectant and conservative attitude. There was no spontaneous complaint of diplopia; when questioned specifically she admitted occasional double vision.

Ophthalmological examination. The uncorrected visual acuity was: R.E., 20/50; L.E., 20/40. Vision in both eyes was improved to 20/20 by a +2D. sph.

There was an apparent ptosis of the left upper lid, and the left palpebral fissure was almost completely closed. The globe was proptosed and displaced downward and outward. The elevation of the upper lid was moderately limited. The globe could be freely rotated in all directions. Tests for diplopia suggested exotropia and left hypotropia. However, the two images were rather close together, and their distance did not alter in the cardinal directions. No chemosis of the conjunctiva bulbi was noted. Behind the left upper lid a fairly distinctly outlined mass could be palpated. The lid was freely movable over this mass. It was about 2.5-cm. long with a 1-cm. diameter, rather firm in consistency, and gave the impression of having a lobulated surface. The tumor seemed in no way connected with either the tear gland or the orbital walls.

Two small fleshy tumors could be observed in the subconjunctival tissue of the left globe. These tumors were flat, measured about 4 mm. in size, and were situated about 10 mm. above the limbus. They did not seem to be closely attached either to the conjunctiva or the sclera.

The eyegrounds were essentially normal.

Physical examination, as reported by the patient's own physician, was in no way remarkable. In particular, there was no increase in the size of the spleen, and no enlarged lymph nodes were noted.

Laboratory data. Red blood count: 4,560,000. Hemoglobin concentration: 14.8 gm. (88.8 percent). Color index: 98.

* From the Department of Ophthalmology, Northwestern University Medical School.

White blood count: 5,900, with 57-percent segmental, 2-percent eosinophilic, 1-percent basophilic cells, 34-percent small lymphocytes, and 6-percent monocytes.

Roentgenographic examination of the skull, including special films of the orbits and optical foramina, showed no evidence of increased intracranial pressure. There was no evidence of abnormal intracranial calcification. The petrous bones presented a normal appearance. The bones of the orbit showed no evidence of destruction or absorption and presented a normal orbital contour. The sphenoidal fissures also were normal. There was slight increase in the soft-tissue density in the left orbit when compared with the right.

Biopsy. One of the subconjunctival tumors was removed for biopsy on November 11, 1946. The report from the Department of Pathology, Mt. Sinai Hospital, was as follows: "Sections show accumulations of small round cells. There is no difference in the size of the cells, and no mitoses could be found. This picture is compatible with a so-called benign lymphocytoma, although a low-grade malignancy cannot be excluded with absolute certainty on a purely histologic basis (see fig. 1).

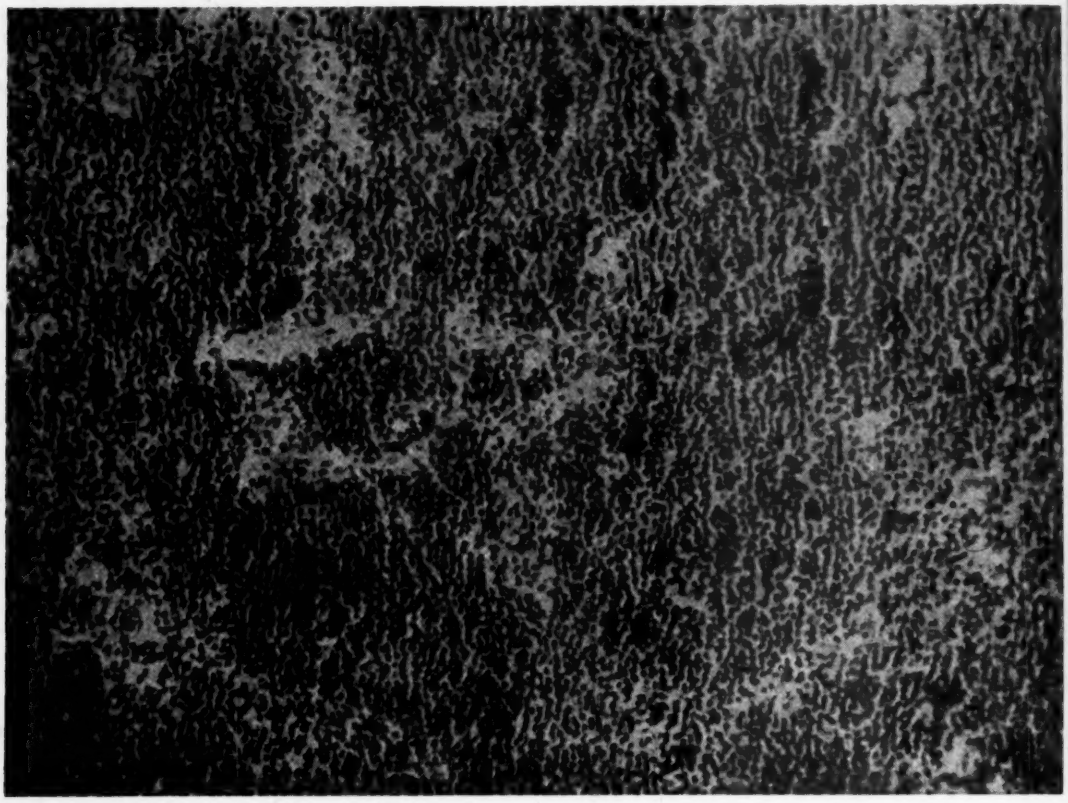

Fig. 1 (Van Wien). Photomicrograph of the biopsy.

Diagnosis. Tumor of left orbit: Lymphocytoma.

Treatment and Course. The patient received 20 drops of saturated potassium iodide for six weeks without any apparent result. She was referred to Dr. H. E. Davis, Chicago, for irradiation, and received 300R on January 7, 9, 11, 13, and 15, 1947—a total of 1,500R. The globe was protected by a lead

contact lens. A decided improvement was noticeable immediately after the first exposure, and the tumor had completely disappeared after completion of the series. There was a slight pigmentation of the episcleral tissue at the site of the small subconjunctival tumor that had not been removed for biopsy.

The patient was seen the last time on June 26, 1947. No recurrence of the tumor was in evidence (see fig. 2).

Fig. 2 (Van Wien). (A) Before treatment. (B) After treatment.

Comment

Hochheim[1] classified lymphomatous tumors of the lids and the orbit according to etiology. He distinguished simple lymphomas, leukemic, pseudoleukemic tumors, and doubtful cases.

Birch-Hirschfeld[2] doubted the correctness of Hochheim's classification, since no complete data of the blood examinations were furnished by this author. He was of the opinion that these tumors could exist with or without other constitutional manifestations. The former occurred in leukemic and aleukemic leukemia as well as in Mikulicz's disease. He admitted the occurrence of a malignant lymphosarcoma in the orbit, but did not believe that differentiation was possible on the basis of the histologic examination only. According to him, neoplasms of this nature may originate from smallest lymph nodes in the orbital tissues, from the lymphocytes of the connective tissue, or from the cells of the vessels. Meller[3] stressed the fact that lymphatic tumors of the orbit might spring from the tear gland.

It is a common experience that lymphomas of the orbit are very sensitive to actinic treatment, a fact that was stressed by Gifford.[4] Not all cases permit biopsy as easily as the one reported. But, if possible, it will help to prevent unnecessary surgery with its unpredictable complications. One such case was reported by Merigot de Treigny.[5] Surgical removal of the tumor was attempted first. This procedure was only a partial success and, to make matters worse, during this attempt the external rectus was severed, resulting in a permanent paralytic strabismus. Histologic examination revealed a lymphocytoma, and subsequent irradiation resulted in complete disappearance of the neoplasm.

Even if the protection of the globe with a lead prothesis should prove unsuccessful, and a cataract should develop subsequently, this may be a more desirable complication than an unsuccessful surgical approach, particularly if functionally important structures are infiltrated by the expanding tumor.

Conclusion

A case of lymphocytoma of the orbit is presented for record.

The diagnosis was established by means of a biopsy, and satisfactory response to roentgen therapy was obtained.

104 South Michigan Avenue (3).

References

1. Hochheim: Quoted by Birch-Hirschfeld. Ein Beitrag zur Kenntnis der symmetrischen Lid- und Orbital Tumoren. Arch. f. Ophth., 51:347, 1900.
2. Birch-Hirschfeld, A.: Handbuch der Gesamten Augenheilkunde. Berlin, Julius Springer, v. 9 (Chap. XIII: Die Krankeiten der Orbita) 1920.
3. Meller, J.: Die lymphomatoesen Geschwulstbildungen in der Orbita und im Auge. Arch. f. Ophth., 62:130, 1906.
4. Gifford, S. R.: A Handbook of Ocular Therapeutics. Philadelphia, Lea & Febiger, 1937.
5. Merigot de Treigny, M.: Un Cas de Lymphocytome de l'Orbite. Paris, Bull. S. O., No. 5 (June) 1936.

NOTES, CASES, INSTRUMENTS

REFRACTION CLINIC*

DISCUSSION BY

ALBERT E. SLOANE, M.D.†
Boston, Massachusetts

A-17-year-old boy had had poor vision as far back as he can remember. His vision had not become worse. He claimed that he could see well at a distance, but was unable to read. The examination revealed a pigmentary disturbance to both macula areas. His vision was: R.E., 15/200; L.E., fingers at five feet. This vision was not improved with lenses and was reduced with the use of a pinhole disc.

Refraction was attempted with the idea of prescribing a reading aid. Retinoscopy disclosed a negligible refractive error. The right eye was chosen for further testing because it had the lesser amount of involvement. It was found that he could read No.-7 type on the Wells card without glasses and by holding the print close so as to obtain a large retinal image. When a +5.D. sph. was worn, he could read Wells No.-4 type by holding the print at the proper short distance. When a telescopic reading aid (Aloe reading telescope) was placed before the +5D. sph., he could read Wells No. 1. It was suggested that he obtain the following prescription: a +5D. sph. for the right eye, to be worn for reading larger newspaper print, and the telescopic addition to be used when he wished to read very fine material.

DISCUSSION

In these cases, children have no difficulty in meeting ordinary visual needs. Their peripheral field of vision seems to compensate for their central vision loss; thus, this boy did not complain of poor distance vision, although by ordinary standards the visual acuity was substandard. For near, he was very definitely handicapped and could only read by holding the print close to his eyes, utilizing large retinal images, even if the details were not clear. Theoretically, any device which would further enlarge the retinal image size would enable him to read.

For this reason, a strong plus sphere, even though it makes for an awkward short range, can be of great help through enlarging the retinal image, and this can be further magnified by the aid of a telescope. A simple telescope, which is inexpensive, is the reading unit manufactured by Aloe Company. The success with such a device is directly proportional to the willingness of the patient to reëducate himself to its use.

The person must learn to utilize and recognize letters by a sort of piece-meal assembly, which is at first very difficult and later becomes quite easy. Parts of long words must be pieced together, a skill which is easily learned.

Further, a patient must learn to keep the print at a very definite distance which does not allow modification, and the print must be moved rather than moving the eyes. A newspaper, for instance, cannot be read if the pages are wide open and held unsupported. Rather, it must be kept flat on the table, and the light must be peculiarly adjusted to the needs of that individual. The successful patient will usually read at the same table and under the same lamp all the time. When successfully learned, the telescope allows the patient the use of both his hands.

Some other aids in such cases are these. First, and most generally used, is the ordinary hand magnifying glass. The hand magnifying glass has the advantage of allowing the patient a larger distance between his eyes and the glass, which allows a further increase in the effective magnification of the printed material. However, it ties up one hand.

* From the House Officers' Teaching Clinic, Massachusetts Eye and Ear Infirmary.
† Director of Department of Refraction.

Another reading aid is a magnifying glass mounted on legs, and cut in the shape of a rectangle. The length of the legs corresponds to the distance required for proper magnification, and it may be slid along the material read. Such a device, which contains within it an illumination system, is also manufactured. Another device is the utilization of magnifying loupes, such as are worn by the ophthalmologists in removing foreign bodies. A satisfactory loupe for this application is the Berger. This has the advantage of being enclosed in a metal casing, thus eliminating glare from the sides. It is moderately priced.

In general it is best to avoid correcting both eyes, and simply to correct the better of the two. Occasionally it is possible to correct both eyes, in which case one has to depend upon strong plus spheres, with or without prisms, but no telescope. The telescope should be reserved for monocular use.

QUESTIONS

House Officer: Have you ever used a device with a linear aperture so that only one line of letters can be seen at a time, thus eliminating confusion in losing one's place?

Dr. Sloane: I have never used such a device, but it would seem to have practical value in certain places. Such devices, I know, are incorporated in many of the methods used to help children who have reading difficulties.

House Officer: Why do you not usually correct both eyes?

Dr. Sloane: The answer to that is: (1) It would seem advisable to utilize both eyes, but we may be introducing difficult problems in binocularity due to the power of the lenses we have to use. (2) The pathologic conditions in such cases may not be perfectly symmetrical and thus again produce incongruous factors. (3) The visual field is limited by such devices, particularly the telescope, and it requires very precise adjustment to keep the field of each eye in proper position.

House Officer: Are telescopic lenses suitable for distance wear?

Dr. Sloane: As a rule telescopic aids have limited uses for distance wear. This is primarily due to the narrowing of the visual field, which is a necessary part of the corrected picture. Incidentally, a very effective type of telescopic lens may be procured for distance wear, in this manner. First, give the patient the best distance correction possible with ordinary lenses, and then, secondly, have him purchase a "Sportoscope,"* which is in reality a pair of opera glasses made with temples which fit over one's ordinary glasses. The cost is not excessive and this device can be used effectively for sport events and at the theatre, but of course not in walking.

243 Charles Street (14).

LEIOMYOMA OF THE IRIS

E. C. MOULTON, M.D., AND
E. C. MOULTON, JR., M.D.
Fort Smith, Arkansas

A search of the literature reveals that seven proved cases of leiomyoma of the iris have been reported. In 1923, Verhoeff[1] reported a case, and at the same time reviewed the literature and established certain criteria as necessary for the diagnosis of this tumor. According to these criteria, he accepted only two previously reported cases as being authentic, Thompson's[2] case, in 1899, and van Duysen's[3] case, in 1911. Frost,[4] in 1937, and Ellett,[5] in 1939, each reported a case. In 1943, Kahler, Wallace, Irvine, and Irvine[6] described a case, and, in 1944, Davis, Sheppard, and Romejko[7] reported one. In addition, two cases which were not the subject of separate reports have been mentioned in the literature. These include a separate case of Verhoeff's, mentioned by Li,[8] in 1923, as a "probable epiblastic leiomyoma," and a case of Zentmayer's, previously reported as

*Also known as "All-scope" and obtainable (before the war) from Andrew J. Lloyd Company, Boston, Massachusetts.

a primary leukosarcoma of the iris, but mentioned in Davis's[7] paper as having been proved on reëxamination to be a leiomyoma.

In order for the diagnosis of leiomyoma of the iris to be made, Verhoeff has said that the tumor must be made up of long spindle-shaped cells of uniform size, containing rod-shaped nuclei, and showing a tendency for the cells to occur in bundles with their nuclei arranged in rows. In addition, differential staining should show myofibrils "coursing along the cells and their terminal processes."

Case report

B. H. C., a white man, aged 56 years, was first seen by one of us on April 17, 1946. He gave a history of having noticed a small growth on the right eye 1½ years previously, and that it had gradually grown to the present size. There was no history of discomfort or inflammation in that eye, although he had noticed that the vision had failed considerably.

Eye examination showed vision to be: R.E., 4/200, unimproved; L.E., 20/200, improved to 20/25 with a +2.5D. sph. There was a large, egg-shaped, salmon-colored tumor mass, approximately 5 by 7 mm., filling the angle of the anterior chamber in the lower outer quadrant, and seeming to replace the iris in that area. The mass was beginning to encroach upon the pupillary area. Blood vessels were seen on the surface of the tumor. The pupil reacted normally except in the area of the tumor. There were no cells in the anterior chamber. The lens showed advanced cataractous changes and details of the fundus could not be made out through these opacities. A diagnosis of leukosarcoma was made.

An attempt at local removal was thought impractical because of the large size of the tumor, and removal of the eye was advised. Enucleation was performed on April 25, 1946, and the eye was sent to the pathologic laboratory of the Massachusetts Eye and Ear Infirmary for examination.

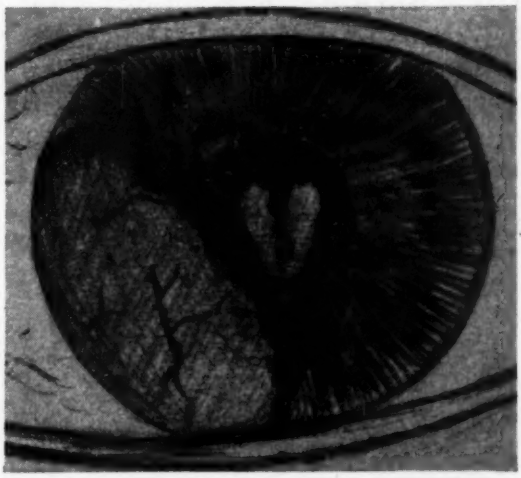

Fig. 1 (Moulton). A drawing made at the time the patient was first seen, showing the size and location of the tumor mass.

Pathologic report

The specimen consisted of an eye of approximately normal dimensions, showing in the gross a mass occupying most of the anterior chamber. Microscopically the angle of the anterior chamber and the iris on one side were essentially normal, except that the pigment epithelium of the iris showed some vacuolization. The pillar of the iris on the other side was largely replaced by a tumor mass extending forward to occupy the entire lateral two thirds of the anterior chamber in apposition with the posterior surface of the cornea.

This tumor was made up of fascicles of spindle-shaped cells showing rod-shaped nuclei with no nucleoli. The cells were arranged in interlacing bundles, with the nuclei occasionally arranged in rows. None of the cells appeared pigmented, although pigment was scattered extracellularly throughout the mass.

The tumor merged gradually into the anterior border of the ciliary body, without any sharply defined border, but did not extend into the ciliary muscle. There was very little vascularization. No necrosis was present and no mitoses were seen. The lens was

cataractous. The rest of the eye was not remarkable.

Further sections were made and stained with Mallory's phosphotungstic acid-hematoxylin stain. These showed a rather dense arrangement of myofibrils coursing along the cells and from their terminal processes. Sections were reviewed by Dr. F. H. Verhoeff who concurred in the diagnosis of leiomyoma of the iris.

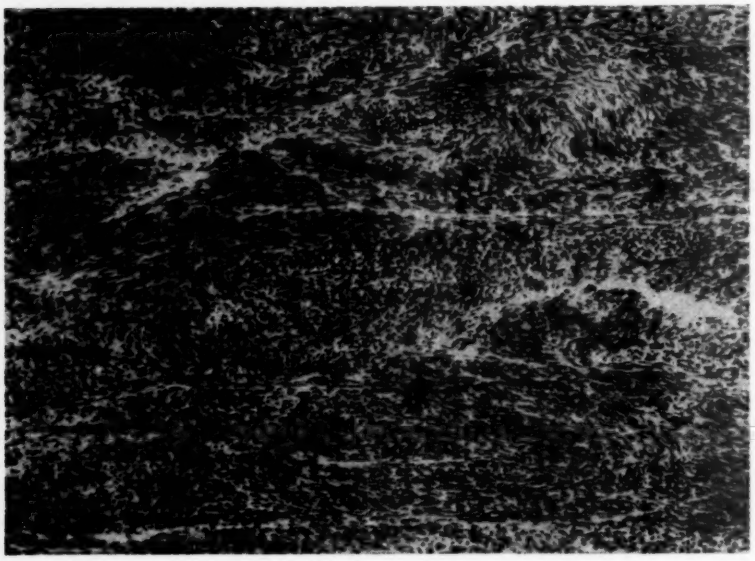

Fig. 2 (Moulton). A photomicrograph (×100) of a section of the tumor tissue, showing the typical architecture of this tumor.

Comment

It was impossible to tell whether this tumor arose from the iris musculature or from the iris stroma, since the tumor mass occupied the whole of the iris pillar, and the individual sphincter and dilator muscle groups were not recognizable in any of the sections showing tumor.

Of the previously reported cases, five were said to be epiblastic and one mesoblastic in origin. The origin of the other three was not stated. Of these cases, six were in males and four in females, ranging in age from 10 to 56 years. The ages in the largest group, five, were between 46 and 56 years of age. All of these growths were described as salmon or flesh colored.

The duration of the growth was from 1 to 2 years in three cases, 20 years in one case, had "always been present" in two cases, and was not stated in the other four cases. Six of these cases were treated by local removal, or iridectomy, and three by enucleation because of suspected malignancy. The other case, reported by Verhoeff, resulted in enucleation after two unsuccessful local procedures.

Of considerable interest was the location of these iris leiomyomas. Of these 10 cases, 8 were found in the lower outer quadrant, 1 in the lower inner quadrant, and the location of the other case was not stated.

Whether there is any connection between this finding and the fact that the lower outer quadrant of the globe is the typical location of the fetal fissure is a matter for conjecture. The fetal fissure is normally closed anteriorly long before the iris proper develops, and these cases do not usually come to a physician's attention before the third decade of life is reached.

There are 93 cases of malignant and nonmalignant melanomas of the iris on file in the pathologic laboratory of the Massachusetts Eye and Ear Infirmary. Of the available

clinical records only 32 mentioned the original location of the tumor. Eight, or 25 percent, arose in the lower outer quadrant; 12 were described as ring sarcomas; and the remaining 12 were evenly distributed among the other three quadrants.

These few cases do not necessarily indicate that leiomyomas of the iris have a predilection for the lower outer quadrant. However, the occurrence in the lower outer quadrant of the iris of a localized, salmon- or flesh-colored tumor mass of slow growing tendencies should suggest leiomyoma, and, if the size of the tumor permits, an attempt at local removal should be considered before the eye is removed.

Merchants National Bank Building.

References

1. Verhoeff, F. H.: A case of mesoblastic leiomyoma of the iris. Arch. of Ophth., **52**:132-139 (Mar.) 1923.
2. Thompson, A. H.: Tumor of the iris. Tr. Ophth. Soc. U. K., **19**:45-52, 1899.
3. van Duysen: Leiomyome sarcomatode, leiomyome malin de l'iris. Arch. d'Ophth., **31**:13-34, 1911.
4. Frost, A. D.: Leiomyoma of the iris. A. J. Ophth., **20**:347-353 (Apr.) 1937.
5. Ellett, E. C.: Leiomyoma and hematoma of the iris. Arch. of Ophth., **21**:497-498 (Mar.) 1939.
6. Kahler, J. E., Wallace, W. E., Irvine, R., and Irvine, A. R.: Leiomyoma of the iris. Arch. of Ophth., **29**:479-484 (Mar.) 1943.
7. Davis, W. T., Sheppard, E. and Romejko, W. J.: Leiomyoma of the iris. A. J. Ophth., **27**:467-469 (May) 1944.
8. Li, T. M.: Primary ring sarcoma of the iris. A. J. Ophth., **6**:545 (July) 1923.

A CORNEOSCLERAL SCISSORS

William P. McGuire, M.D.
Winchester, Virginia

In an effort to obtain a smoother incision in enlarging the original limbal incision in cataract surgery, a new scissors has been designed. The blades of the scissors are blunt pointed and are angled up 15 degrees at the proximal end of the cutting surfaces. From this angle the blades are curved downward in a gentle curve closely approximating the curve of the anterior surface of the cornea.

In practical application the advantages of this scissors have been found to be:

1. The upward angulation makes for easier manipulation.

2. The downward curve of the blades produces a smoother cut along the limbus than does the ordinary flat-bladed scissors or scissors with the blades curved upward.

3. It is unnecessary to cut the conjunctiva with the scissors as the curve permits the outer blade to be inserted beneath the conjunctiva and the limbal incision to be enlarged beneath a conjunctival bridge.

4. In the event of involuntary upward movement of the eye, the danger of trauma to the corneal endothelium is lessened and

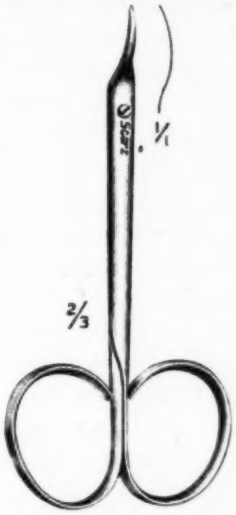

Fig. 1 (McGuire). Corneoscleral scissors of new design.

the blunt point slides along the angle of the anterior chamber.

This instrument is manufactured by the Storz Instrument Company, St. Louis, Missouri.

105 North Braddock Street.

SOCIETY PROCEEDINGS

Edited by DONALD J. LYLE, M.D.

NEW ENGLAND OPHTHALMOLOGICAL SOCIETY

February 19, 1947

DR. HOWARD F. HILL, *presiding*

RHEUMATOID IRITIS

DR. LLOYD MILLS presented the preliminary paper of the evening, reviewing the records of 42 patients with iritis that were found in 600 cases of rheumatoid arthritis now being followed by the arthritis service of the Massachusetts General Hospital. In 29 of these 42 cases, no other possible alternative etiology, such as focus of infection and so forth, was found, suggesting a direct association between the arthritis and the iritis. Of these 29 cases, 19 occurred in men, 10 in women. The age of onset varied from 3 to 63 years. In 9 cases the iritis was unilateral; in 20 cases it was bilateral, both eyes being involved at the same time in 15 cases. The visual result in the bilateral cases was approximately the same in both eyes even though the severity of the iritis varied between the two eyes. Usually the iritis was first noticed 1 to 17 years after the onset of arthritis. In one case the onset of the iritis and arthritis coincided, and in three cases an iritis of "unknown etiology" preceded the arthritis with later exacerbations of iritis characteristic of this group. About half the iritis episodes occurred during chronic activity or an acute exacerbation of the arthritis, the others occurring during remissions of months to years or, in three cases, prior to joint symptoms. The severity of the iritis varied widely—three cases had single brief attacks; nine, recurrent mild attacks; four, a mild chronic course; two were classic cases of ophthalmia lenta. There were two fulminating cases, one severe recurrent case, and eight severe chronic cases, all ending in marked visual impairment. The visual end results varied with the course of the disease. In 11 cases, normal vision was retained; seven cases ended with vision of 20/70 to 20/200, and 11 with vision of hand movements or less. Secondary glaucoma resulted in eight of these cases, and enucleations were necessary in two.

Dr. Mills noted that only meager statistics with poor etiologic studies appear in the literature. Evaluation of treatment that has been recommended is difficult because the disease has no known specific treatment and has a fluctuating, if progressive, course. In his series, no case with glaucoma had an iridectomy or filtering procedure early enough to learn the value of early surgery, and he thought such intervention must be strongly considered in obviously progressive cases.

In conclusion, he noted that, statistically, 6,000,000 people in the United States have rheumatic diseases, that iritis of rheumatoid arthritis is an etiologic entity and occurs frequently enough so that adequate medical investigation with thorough case following will decrease the enormous group of cases which at present are diagnosed as "Iritis—cause unknown."

SURGICAL TREATMENT OF STRABISMUS IN CHILDREN

DR. MAYNARD WHEELER of New York gave the principal paper of the evening. He said that preoperative analysis is of the greatest importance in cases of strabismus. The cases can be divided into two groups: (1) those in whom the deviation is discovered soon after birth and (2) those in whom the squint appears gradually after the age of two years. In the first group the deviation is large, frequently with a vertical component; refraction is usually unimportant. Measurement is done by corneal reflexes.

Operation should be done early (one year) for the psychologic effect on both the child and his parents; to avoid muscle changes, amblyopia, and abnormal retinal correspondence; and to give the best chance for binocular vision. In the second and much larger group, refraction is usually of some importance. A more complete analysis is possible with greatest reliance on the cover test. When hyperopia is very high, surgery is usually contraindicated. If glasses are essential for vision but do not straighten the eyes, the portion of the deviation remaining with glasses may be corrected cautiously by surgery. When glasses are not essential to vision, after a trial of several months, they may be discontinued for surgery. In all cases, amblyopia should be treated by occlusion. Operation should be done as soon as other measures fail; surely before the child enters school.

The choice of operation and the technique used were not stressed because of the difficulty of trying to tell anyone how to correct a given deviation. Each surgeon must select the operation that he can do best, and find out what it will accomplish.

In the discussion that followed, Dr. Walter Lancaster suggested the use of the red-green test for measuring the deviation of the eyes in the six cardinal directions. Dr. Wheeler said that he had not found it satisfactory in the usual strabismus cases, possibly because of incorrect use. Dr. Lancaster also commented that he thought that a certain amount of upshoot in extreme adduction is normal, and that he agreed with Dr. Wheeler that the teaching of Bielschowsky and Adler in regard to the overaction of the inferior obliques is the correct one. Dr. Lancaster then brought up the point of orthoptic training to break up the convergence-accommodation relationship and to teach the patient with hyperopia to keep the eyes straight without wearing his correction.

Dr. Frederick Verhoeff discussed the factor of "anticipatory movement" complicating the cover test. He suggested that instead of passing the cover from one eye to the other, it was only necessary to cover the fixing eye, thus decreasing the anticipatory movement. He also said that in a strabismus that is not strictly concomitant it would make a difference as to which eye had the prism in front of it when doing the cover test. He stated that so-called alternating hyperphoria is an incorrect term. A better name is exclusion hyperphoria, the eye turning up because it is excluded from vision. This condition sometimes upsets the cover test. He suggested that, instead of using a complete occluder in the occlusion test, one might use a strong sphere in front of one eye, thus using both eyes right along, one for distance, and the other for near. Dr. Wheeler in reply agreed with Dr. Verhoeff's comments on anticipatory movements. He thought that prisms could be used to measure the exclusion hyperphoria, by measuring each eye separately, passing prisms of varying degrees in front of the eye until motion was stopped.

Dr. Paul Chandler asked after what age it is probably not worth while to occlude to improve amblyopia, and also after what age the vision is maintained when the occlusion has been stopped. Dr. Wheeler said that after the age of 6 or 7 years he did not urge occlusion unless the parents were keen for it, since constant occlusion after that age is psychologically bad and results are not too gratifying. He also thought that at about this same age vision is maintained when occlusion has been stopped.

In closing, Dr. Wheeler answered Dr. Howard Hills's questions in regard to prisms and catgut. He said that glass prisms are far preferable to plastic because the latter are inaccurate, rather thick, scratch, and are spoiled by alchohol. He has found that plain catgut is softer, easier to work with, and absorbs more easily. Since he started to use it, he has had no regrets.

Mahlon T. Easton,
Reporter.

COLORADO OPHTHALMOLOGICAL SOCIETY

February 15, 1947

Dr. George Stine, *presiding*

Boeck's sarcoid

Dr. Morris Kaplan presented a paper, including a case report, on this disease which was published in the Journal, 31:83-85 (Jan.) 1948.

Dr. S. S. Kauvar (by invitation) presented a paper on the medical aspects of Boeck's sarcoid. He stressed its close similarity to tuberculosis, both clinically and pathologically. It is entirely benign except in the eye and in such places as the central nervous system and mediastinum where the tubercles cause difficulty because of mechanical interference. He stressed the spontaneity of recovery, with an occasional relapse. In several cases of sarcoid, the patients, years later, developed pulmonary tuberculosis, all of the fulminating miliary type.

Dr. Fritz Nelson presented three oil sketches of sarcoidosis of the iris, made many years ago, in which the true diagnosis was not made for years after the acute phase of the illness. Dr. George Filmer stated that in the Army he had treated five proved cases of uveitis caused by sarcoid. All were mild and painless and were characterized by blurring of vision, with numerous cells in the aqueous. All were bilateral. Four of these cases occurred in Negroes.

Malignant melanoma

Dr. James C. Strong presented a white woman, aged 32 years, who came on February 12, 1947, for an eye examination. Her chief complaint was blurring of vision in the right eye for the past three months. She stated that objects seen with this eye had a wavy appearance, which was first noticed while reading. Progress was slow but her vision failed more with each passing week. She had occasional headaches which were not severe and for the past two months she had noticed flashes of light especially in the nasal field. She also noticed that vision to the left, with the right eye, was somewhat impaired.

The general physical examination was entirely negative except for the eye findings. Examination of the right eye showed the extraocular muscles to be normal. The right iris was as active as the left. The pupil reacted to light and accommodation, direct and consensual. The cornea was normal. No keratic precipitates were present. There was a faint beam in the anterior chamber; however, no cells were observed in definite clumps. The iris was normal throughout its substance. The lens was clear. No opacities were present. The vitreous was filled with golden particles which were quite large. The vitreous was not liquid. Upon opthalmoscopic examination, there was found a large retinal detachment. The detached retina was quite smooth and rounded and was seen in the temporal portion of the eye. It extended from the 11- to the 6:30-o'clock positions, from the ora serrata to within six disc diameters of the optic nerve. At the 9-o'clock position, there was an area composed of brown pigment and some old hemorrhage with a vessel running into this area. Part of the vessel showed sclerotic changes. This pigment area protruded above the level of the retina, surrounding it. Hemorrhage was observed near the ora serrata and inferiorly, at the 6-o'clock position. This hemorrhage seemed very recent.

Six disc diameters from the optic nerve, the retina lost its healthy normal appearance. It took on a grayish cast and there were numerous traction lines which ran vertically and obliquely. There was an area of chorioretinitis superior and temporal to the macula. The margin of the temporal portion of the nerve was not well defined, there being an area of gray, opaque tissue passing from the nasal portion of the disc inferiorly and temporally. New blood vessels were

growing into this tissue. No retinal tears could be observed; however, this pigmented area over the retinal detachment suggested degeneration of the retinal tissue with possible tumor formation showing beneath. The vessels over the greater part of the detachment did not have their normal appearance. Many of the vessels inferiorly and temporally had white streaks along their walls.

The tension of the right eye was 18 mm. Hg (Gradle-Schiøtz) and of the left eye, 19 mm. Corrected vision was: R.E., 20/40; L.E., 20/15. The right eye did not transilluminate in the temporal portion. The field of vision showed marked constriction in the upper and nasal field on the perimeter and on the Bjerrum screen. The left eye was normal throughout. The patient stated that her right eye had previously been her better eye.

Laboratory findings were negative except for the presence of melanin in the urine. X-ray studies of the skull and chest showed no pathologic condition.

Discussion. Dr. Fritz Nelson said that the condition was most likely a malignant melanoma, with detachment over the solid mass and felt that enucleation should be done as soon as possible. Dr. John C. Long quoted Theobald as saying that these melanomas may well originate in the long nerves which should give corneal anesthesia.

Ten days after this case was presented to the Society, the patient's right eye was enucleated. The laboratory report was as follows:

Macroscopic examination. The specimen is an intact globe measuring A/P 23 mm.; horizontally and vertically, 23 mm. each. The cornea is transparent. The anterior chamber is deep and in it there is a white flaky piece of material, measuring 3 x 1 mm.

On section, the cornea appears normal. The lens has been displaced by sectioning. The anterior lens capsule displays a ring of pigment. The outstanding feature of the section it is a rather large oval-shaped grayish mass, measuring 9 x 5 mm., which appears to arise from the choroid and protrudes into the vitreous cavity. The retina is lying over this mass. Numerous hemorrhages are visible in this portion of the retina. Posterior to the mass, the retina is detached for a distance of approximately 10 mm. A white, gelatinous, semisolid material, together with a small amount of blood, lies beneath the retina in this location.

The vitreous chamber is filled with a clear, jelly-like material.

Microscopic examination: The paraffin section shows a tumor mass arising from the choroid. The tumor is composed of spindle cells with oval nuclei, most of which show a definite nucleolus. The reticulation in the nuclei is rather coarse. Both the inner and outer surfaces of the tumor show extensive pigmental deposits. The retina shows extensive hemorrhagic areas and is separated from the tumor by a serous exudate at one margin.

Diagnosis. Melanoma spindle cell, subtype B.

Morris Kaplan,
Secretary.

NEW YORK SOCIETY FOR CLINICAL OPHTHALMOLOGY

February 3, 1947

DR. BENJAMIN FRIEDMAN, *president*

TREATMENT OF LINDAU'S DISEASE

DR. STERLING BOCKOVEN AND DR. PAUL LEVATIN presented a case of Lindau's disease with unusual manifestations. Dr. Levatin stated that cord compression was caused by a histologically verified sclerosing hemangioma arising from the cord; whereas, a solitary coexisting retinal angioma was asymptomatic. The retinal tumor was treated by electrocoagulation without any loss of vision and the success of this treatment furnishes additional support for the view that puncture diathermy is the method of

choice in the treatment of von Hippel's disease. The cord tumor had previously been treated by X ray, but one year later further cord involvement had occurred. Dr. Levatin concluded that funduscopic examination under a mydriatic be done preoperatively in all instances of suspected cord tumors to detect isolated cases of Lindau's disease.

Discussion. Dr. Ludwig von Sallmann said that, in 1935, he had reported a case of Hippel-Lindau's disease which was treated successfully with beta rays. He stated that he did not know which was preferable, the beta ray or the diathermy treatment. Dr. von Sallmann concluded that the good result in Dr. Levatin's case would indicate that there is no contraindication for the diathery-puncture treatment in circumscribed lesions.

Dr. Joseph Igersheimer stated that in his experience these cases always become so much worse that they finally become blind. Therefore, he felt that it is justifiable to try the diathermy procedure. Dr. Igersheimer said that von Hippel first described the retinal changes on the ground of anatomic investigations and called them a "very rare disease of the retina." By further studies he came to the conclusion that the retinal disease was a hemangioma and in this conclusion he was correct. About 20 years later, Lindau found that the central nervous system and other organs show these angiomas and that involvement of the eye was a manifestation of a general disease. Dr. Igersheimer proposed that this disease be called von Hippel-Lindau's disease, especially when there are characteristic changes in the eye.

Dr. Adolph Posner said that from his experience in diathermy treatment of retinal detachments, he felt there is no great danger involved in the treatment of dilated veins of von Hippel's disease by this method. Dr. Posner said that he had frequently seen the vena vorticosa coagulated or even punctured with no untoward consequences.

Dr. Levatin (in closing) replied to Dr. Benjamin Friedman as to the advisability of any treatment in cases of angiomatosis retinae, which are nonsymptomatic. Because blindness due to detachment of the retina and secondary glaucoma is the eventual result in all untreated cases of von Hippel's disease, Dr. Levatin said that Dr. Bockoven and he believed that treatment by electrosurgery or irradiation is indicated. Since this was a very early case, it was possible to distinguish between the feeding artery and vein, for the artery was of a light pink color and was beaded.

In reply to Dr. Adolph Posner, Dr. Levatin said that Dr. Posner's observation that surprisingly little bleeding occurs when electrosurgery is used in operations on the eye is important. He said that he felt that diathermy puncture is a safe procedure in treating von Hippel's disease because the electric current coagulates the blood vessels.

Oxycephaly with optic atrophy

Dr. Jack V. Lisman presented a paper on this subject which will be published in the March, 1948, issue of the Journal.

Neosynephrin in glaucoma simplex

Dr. Adolph Posner suggested the use of neosynephrin hydrochloride (10 percent) before considering surgery, in cases of chronic simple glaucoma, when the usual miotics fail to maintain the tension at a normal level. While neosynephrin, alone, has only a fleeting action, it may benefit the patient by increasing the responsiveness of the tension to the subsequent use of miotics. Dr. Posner said that the exact mechanism by which this is accomplished is not known.

Dr. Posner told of two cases in which this method was used. He said that one

drop of 10-percent neosynephrin is instilled into the eye, preferably 12 or more hours after the last use of miotics. The patient is then instructed to dispense with the miotic for 24 hours if possible, after which the use of pilocarpine is resumed in moderate concentrations.

Dr. Posner said that the tension may be slightly increased by the neosynephrin, but that usually it is lowered. The increase in tension never amounts to more than 5 mm. Hg, thus the drug is safe to use in chronic simple glaucoma. Dr. Posner concluded by saying that it should not be used in a congestive type of glaucoma.

Discussion. Dr. James W. Smith said that it is a well-known fact that miotics used over a long period of time may lose their effectiveness. Clarke, in his report on carcholin (doryl) stated that if the use of pilocarpine and eserine would be discontinued and the patients allowed to use carcholin, better clinical results would be obtained when they resumed instillations of pilocarpine and eserine.

Dr. Posner mentioned the variations in tonometric readings in the hands of competent observers. Dr. Smith said that it is known that many tonometers are not calibrated properly. For this reason the tendency in some clinics of using a tonometric recording to establish a rapid diagnosis of glaucoma is to be deplored. The accuracy of the instrument on repeated trials, the mental attitude of the patient, and conditions under which the pressure is recorded are factors that may raise a normal reading to an apparently increased level.

If the perimetric field and visual acuity are unchanged, Dr. Smith said that he would view with reservations a tonometric recording of 5 to 10 mm. Hg above normal unless verified repeatedly on different days.

Dr. Benjamin Friedman said that successive readings with the tonometer frequently produce variations up to 5 mm. Hg either way, so that small discrepancies are no definite evidence of glaucoma.

Dr. Paul Levatin remarked that he had used 10-percent neosynephrin in a few cases of glaucoma, secondary to cataract extraction or to discission, in which 2-percent pilocarpine was ineffective. In each case it brought the tension down to normal very rapidly, although the effect was not permanent. When it was used on one occasion in a youth with a secondary glaucoma after an iridocyclitis, it produced a rapid painful rise in tension to 50-mm. Hg. The tension could not be brought down to normal by 2-percent pilocarpine every 15 minutes for 3 hours. Since that incident, Dr. Levatin said that he has confined its use to glaucoma, secondary to cataract extraction or discission, in which atropine had been used.

Dr. Joseph Igersheimer said that the fact that neosynephrin causes, in rare instances, an acute attack of glaucoma is very unfortunate, but cannot be generalized. He said that the same experience had occurred with the use of glaucosan. Dr. Igersheimer stressed the importance of seeing that the anterior chamber is not shallow because any dilatation of the pupil when the chamber is shallow may cause an increase of intraocular pressure.

In reply to Dr. Smith, Dr. Posner said that he agreed with Dr. Smith in regard to the use of the tonometer. He felt, however, that because the tonometer is not a perfect instrument, we should not do away with it. He stated that fields should be used as a follow up. Sometimes, however, field changes develop only after a long period of time.

To Dr. Friedman, Dr. Posner said that as for variations in readings, he trys to eliminate these by taking repeated readings on each eye, and then going back to the first eye, and if there is any difference between the first and second readings of the same eye, then he said he would wait

one minute or so and repeat again until consistently lower readings are obtained.

Intraepithelial epithelioma

Dr. Benjamin Esterman, Dr. Joseph Laval, and Dr. Clara Okrainetz presented a paper on Bowen's disease of the cornea and conjunctiva treated by radiation which was published in the Journal, 30:1537-1540 (Dec.) 1947.

Discussion. Dr. Ludwig von Sallmann said that he had had no personal experience with the X-ray treatment of Bowen's tumor. He mentioned a report by Kumer and him, in 1929, on 12 cases of epibulbar epithelioma, which were treated postoperatively with beta rays. Six of the cases, with an average observation time of five years, were considered cured.

Cataracts following maternal rubella

Dr. Leon H. Ehrlich described a girl born November, 1943, with congenital cataracts. The mother had had rubella during the first month of pregnancy. Aside from dense complete cataracts, the examination, ocular and general, was negative, although subsequently it was found that the child was deaf. Esotropia and nystagmus also developed. The lenses gradually became thinner and a red fundus reflex could be visualized. Eventually the lenses absorbed completely leaving only thin membranes, which, however, were sufficiently dense to require discission. The right membrane divided easily with no evidence of the presence of any lens substance; the left membrane tore loose and formed a small ball in the anterior chamber. The visual acuity could not be determined but the parents state that the child obviously has useful vision.

Dr. Ehrlich said that this type of transformation of congenital cataracts was well described as early as 1811 by Saunders, but that modern textbooks give it little or scant attention. Three cases were found in the recent literature on congenital rubella cataracts in which empty capsules, with no lens substance, were found at operation, but in none of them had there been a loss of lens substance while under observation. In two cases there was some presumptive evidence of such loss.

Discussion. Dr. Benjamin Friedman said that in children that are difficult to examine without general anesthesia, the condition is frequently overlooked. He said that, when one sees a membranous cataract, one assumes it represents the anterior portion of the lens. Unless one uses the slitlamp or a similar method of examination, this condition is overlooked.

Epidermoid cysts of the caruncle

Dr. Daniel M. Rolett presented two cases of epidermoid cysts—one located in the caruncle and one of the lacrimal gland. His paper was published in the Journal, 30:1577-1580 (Dec.) 1947.

Keratitis associated with lichen planus

Dr. Jacob Goldsmith reported the only known case of deep keratitis associated with atypical lichen planus. This new dermatologic entity was first observed during World War II. The corneal involvement appeared during the height of the skin malady and closely paralleled the course of the skin affection. The pathologic process commenced in the central portion of the posterior layers of the cornea and progressed anteriorly to involve the epithelium. The disease process on regression receded in the opposite direction. Vascularization was absent throughout the keratitis. The patient eventually regained 20/20 vision.

Dr. Goldsmith said that recent studies show that there is a close relationship between prolonged atabrine ingestion and the development of atypical lichen planus. Dr. Goldsmith expressed the opinion that

both the atabrine medication and the severe destructive skin lesions played an important role in the production of the deep keratitis. Circumcorneal pigmentation following long-continued use of atabrine was demonstrated as a yellowish-green limbal glow by sclerotic scatter.

Bernard Kronenberg,
Secretary.

CHICAGO OPHTHALMOLOGICAL SOCIETY

December 16, 1946

DR. WILLIAM A. MANN, *president*

CLINICAL PROGRAM

(Presented by the staff of the Illinois Eye and Ear Infirmary)

BILATERAL CATARACTS DUE TO LATENT TETANY

DR. HARRY I. WEINER presented a 32-year-old white women who entered the hospital on October 21, 1946, with complaint of impaired vision getting progressively worse following a thyroidectomy five years previously. The patient reported that following surgery and while still in the hospital she experienced several attacks of muscle cramps with carpopedal spasm but that she had no convulsions. During the five years following the thyroidectomy, the patient stated she enjoyed good health except that her teeth became carious and had to be extracted, her hair and nails became brittle and that she noticed progressive failing vision bilaterally until at the time of hospital admission she was unable to get around by herself.

Physical examination revealed a congenital shortening, contracture, and atrophy of the right thigh and leg, brittleness of the hair and nails, and edentulousness.

The neurologic examination disclosed the following: Chvostek's sign, positive bilaterally; von Bornsdorff's phenomenon, positive; and Erb's sign, positive. Laboratory findings were: serum calcium, 6.8 mg. per 100 cc.; serum inorganic phosphorous, 7.4 mg. per 100 cc.

Ophthalmologic examination revealed a visual acuity of finger counting at 18 inches, with good light perception and projection in each eye—noncorrectible. The anterior segments were normal. The pupils were round, equal, concentric and measured 3 mm. each. They reacted to light briskly. The anterior chambers were deep and optically inactive. The lens changes were identical in both eyes and consisted of a ground-glass appearance of the capsule with an occasional punctate opacity. There was a clear zone immediately behind the capsule. The deeper layers of the cortex, particularly at the posterior pole, revealed a number of gray and white opacities, punctate and flaky in configuration. The nucleus in each lens was surrounded by a large homogeneous opacity. The media and fundi were not visualized because of lens density.

The lens of the left eye was extracted intracapsularly on October 22, 1946, with no attendant complications. The anterior chamber did not reform completely until the fifth postoperative day. A small amount of bleeding was noted from the lips of the section, but it was resorbed without treatment. The remainder of the hospital tenure was uneventful. The patient was discharged on the 14th postoperative day. Vision was 20/40, with a +11D. sph. $\bigcirc$ +2D. cyl. ax. 45°.

On readmission to the hospital, the patient's vision was 20/30, with +10.75D. sph. $\bigcirc$ +1.00D. cyl. ax. 180°. The lens of the right eye was as previously noted. The extraction was delayed because of an intercurrent polyarthritis of unknown origin.

This patient was presented as a typical case of hypoparathyroid cataracts following a thyroidectomy after which latent tetany, with attendant dental decay, brittleness of

hair and nails, and carpopedal spasm, was experienced.

Chorioretinitis sclopetaria

Dr. William R. Eubank presented a colored woman, aged 33 years, who was seen for the first time on June 3, 1946. She stated that 11 years previously she had been shot through the head, the bullet emerging below the left eye. Except for eight hours of unconsciousness and difficulty in swallowing for two weeks afterward, there had been no sequelae. She said that her visual acuity had been checked and found to be equally good in each eye. Recently she happened to notice that the sight in the left eye was much worse than that in the right.

Examination showed that, two inches inferoposteriorly to the right mastoid process, there was a quarter-inch circular scar, evidently the bullet's point of entry. Immediately above the left orbital rim, in its inner third, was a stellate-shaped scar, one-fourth inch in diameter, apparently the point of exit. Unaided visual acuity was: R.E., 20/20; L.E., 20/200, uncorrectible. Externally the eyes appeared normal. No abnormalities of the extraocular muscles were found. The right fundus was a normal negroid type The left optic disc was normal in appearance. The retina immediately surrounding the macular area had an increased pigmentation and light reflex. It appeared to have a slight elevation in the center of which was a round, sharply punched-out hole one-half disc diameter in size. On the temporal rim of the crater were several other very small holes. Beginning three disc diameters inferiorly from the disc, the retina appeared to be disorganized and uneven, with large areas of heavy pigmentation and white scar tissue. A few retinal vessels were seen to course over portions of this. The striking retinal lesion extended from the 3- to 7-o'clock positions and to the extreme periphery. The remainder of the fundus was normal.

General physical and neurologic examinations were normal. Blood Wassermann and urinalysis were negative. X-ray findings were as follows: "Films of the skull show an irregular distribution of metallic densities extending from the atlas anteriorly to the inferior orbital plate. The path of these metallic bodies apparently crosses from right to left along the base of the skull. There is a suggestion of a radiolucent area in the posterior-inferior orbital plate on the left side, which could be secondary to a penetrating wound."

A diagnosis of hole in the macula, and chorioretinitis sclopetaria (from new Latin sclopetum, a gun) was made. No treatment was considered to be indicated.

Adie's syndrome

Dr. William R. Eubank presented a white man, aged 40 years, who was first seen on December 3, 1946, at which time he complained only of blurring of vision and fatigue after close work of one year's duration. This condition was relieved somewhat by the glasses he had worn for three years. The patient stated that his mother had noticed that his right pupil was larger than the left from the time of his birth. Other pertinent history included a left facial paralysis, thought to be caused by infected tonsils. of six months' duration and followed by complete recovery. In 1941, he had had a moderate hypertension for which he had received intermittent treatment ever since.

Examination showed vision to be: R.E. 20/30−2; L.E., 20/40. This was improved to 20/20 in each eye by a low compound-myopic astigmatic correction. Accommodation was +2.25D. in each eye. Except for a moderate convergence insufficiency and the pupillary abnormalities, eye findings were normal. Both pupils were slightly irregular, the right measuring 4 mm. and the left, 2½ mm. The right pupil did not react appreciably to light, directly or consenusually. Following binocular occlusion of 45 minutes, it dilated to 5½ mm., then slowly contracted

to 4 mm. again. Convergence caused a slow constriction to 1.5 mm., equalling that of the left pupil. Relaxation of convergence caused the right pupil to dilate slowly to 4 mm., while the left pupil dilated more rapidly to 2.5 mm. The left pupil reacted to light and convergence both directly and consensually. No subjective lag in accommodation was found in either eye. Instillation of 2-percent homatropine hydrobromide dilated both pupils widely and equally. Neither pupil constricted following instillation of three drops of 5-percent mecholyl.

Other pertinent findings were as follows: Blood pressure was 200/100 mm. Hg. Patellar reflexes were present and equal but diminished. Achilles reflexes were not elicited. Romberg's sign negative. Blood Wassermann and urinalysis were negative.

From the above findings a diagnosis of Adie's syndrome was made. This condition differs from the Argyll-Robertson pupil which has the following characteristics: (1) pupils are miotic; (2) bilateral in 90 percent of cases; (3) pupils react promptly and fully to convergence; and (4) they dilate slowly and imperfectly to mydriatics.

Except for correction of the refractive error and of the presbyopia, no treatment was given because Adie's syndrome is of no pathologic significance and is usually symptomless.

Response to D.F.P.

Because of the current interest in di-isopropyl fluorophosphate, Dr. Joseph S. Haas presented three cases which have successfully responded to its administration. In an attempt to evaluate its usefulness 35 patients were treated with D.F.P. in the past five months. Its use has been confined principally to the patients that are refractory or sensitive to the common miotics. A 0.05-percent concentration has been used almost entirely for this concentration seems to be tolerated better and to produce fewer objectionable symptoms. It also seems to have been equally effective. It has also been noted that an increase in dosage beyond three times a day does not cause further decrease in tension.

The first patient was a 70-year-old white man with glaucoma capsulare. Field studies showed: R.E., 10 degrees for 3/300 white; L.E., 10 degrees for 2/1,000 white. Corrected vision was: R.E., 20/250, L.E., 20/90. Gonioscopy showed the characteristic picture of glaucoma capsulare. The patient did not respond to 2-percent pilocarpine, six times a day, or to 0.25-percent eserine, four times a day. On 1-percent carcholin, four times a day, ocular tension averaged 33 mm. Hg (Schiøtz). In July, 1946, the patient was placed on 0.05-percent D.F.P., twice a day, and the average tension reading since then has been 26 mm. Hg, with no record of the tension going above 28 mm. Hg.

The second patient was a 64-year-old white woman who had had bilateral cataract extractions with delayed reformation of the anterior chamber. Gonioscopic examination revealed many peripheral anterior synechias, most pronounced in the right eye. Corrected vision was 20/25 in both eyes, and the central fields were normal to 2/1,000 white. On 2-percent pilocarpine, six times a day, and 0.25-percent eserine, four times daily, tension in the right eye remained poorly controlled reaching 40 mm. Hg on several occasions. The patient was then placed on 0.05-percent D.F.P., twice a day, in the right eye and the tension fell to soft. When the 0.05-percent D.F.P. was cut to once a day, tension rose to a range of 20 to 26 mm. Hg and has remained there since.

The third patient was a 72-year-old white woman with chronic compensated glaucoma and fields at 10 degrees for 2/1,000 white. When she was first seen, tension was 29/45 mm. Hg (Schiøtz). The tension in the left eye did not fall below 35 mm. Hg on 2-percent pilocarpine nitrate, six times daily, 0.25-percent eserine, four times daily, or 1-percent carcholin, four times daily. The patient was then placed on 0.05-percent D.F.P., for the left eye, one time daily, and the tension

fell to 19 mm. Hg, where it has remained since.

In order not to convey a fallacious impression, it is necessary to present some of the disconcerting factors about this new and promising miotic. The above patients have been selected, and it is only right to state that in many cases D.F.P. has caused no reduction in tension. There are also objectionable features. Many patients complain of pain and blurring due, presumably, to the intense ciliary spasm caused by D.F.P. For this reason the aphakic patient seems happiest on the drug. More important than the above symptoms, however, is the fact that in one group of glaucoma patients the drug may actually be harmful. One of our patients, a 72-year-old white woman with chronic incompensated glaucoma, had her left eye fairly well controlled between 21 and 33 mm. Hg on pilocarpine, six times a day. Her gonioscopic picture showed a very shallow angle with the second portion of the trabeculum visible in areas. Corrected vision was 20/19 with a +2.25D. sph. ⊂ +0.75D. cyl. ax. 120°. Her fields were normal. On October 19, 1946, she was placed on D.F.P. once a day, and tension rose to 45 mm. Hg even though the miosis was maximal. The angle details were obscured to gonioscopy, and the patient was blurred with her glasses, but could read 20/19 unaided. The patient was maintained on pilocarpine, and her tension gradually fell to the range of 27 to 31 mm. Hg, but only after seven days did she require her glasses to read 20/19.

In this case it would seem that the D.F.P., either by its intense ciliary spasm or its action on the blood vessels, produced a narrowing of the angle which, coupled with the pre-existing narrow angle, produced a mechanical blockage of the trabeculum. We may conclude, therefore, that although D.F.P. is a useful weapon in the wide-angle group of the glaucomas, it should be used only with extreme caution in the narrow-angle glaucomas, since it may throw an additional burden on an already handicapped angle.

Posterior lenticonus

Dr. Lester Mermell presented a white child, aged 12 years, who came to the Infirmary in November, 1946, with the complaint that she could not see the pictures clearly at the theatre. Her uncorrected vision was: R.E., 20/70; L.E., 20/30. There were no gross findings, and her extraocular muscles apparently functioned normally.

Under atropine cycloplegia her correction was: R.E., 20/70 with a +1.25D. sph. ⊂ +0.75D. cyl. ax. 90°; L.E., 20/20 with a +1.00D. sph. ⊂ +0.50D. cyl. ax. 90°. A pinhole disc in front of the right eye improved the vision to 20/40−2.

At the time of retinoscopy there was a bright shining droplet in the center of the reflex. On slitlamp examination, it was found that the posterior pole of the lens bulged backward into the vitreous in a conical fashion. There was a small opacity at the apex of the cone and another at the center of the posterior Y. This was a case of what Prof. Ida Mann calls a rare lenticular anomaly, posterior lenticonus. This condition is not quite as rare, however, as internal lenticonus or as anterior lenticonus of which, according to Parsons, there have been only two cases reported.

As is the rule with this anomaly, the remainder of the eye is normal, the other eye is unaffected, and there is no familial history.

About 80 percent of recorded cases have a capsular opacity, as seen in this case, and many show a retained hyaloid membrane adherent to the cone. This finding is absent in this case. The exact etiology has not been determined.

Intermittent iris bombé

Dr. S. W. Penn presented a case of a 56-year-old white man, who, 26 years after an injury to his right eye, developed a very rapid failing of vision in his left eye. The sight in his right eye was lost at the time of the injury. The right eye was enucleated,

following which vision in the left eye returned to normal. The histologic diagnosis of the specimen was not obtained. The patient had no ocular difficulties until 28 years later when he developed an attack of acute iritis. In the following year, there were two similar recurrences, all of which responded to treatment. During the last episode the intraocular pressure became slightly elevated and remained so after the eye had become quiet. At this time it was noted that the pupil was 2 mm. in size and was partially occluded by a membrane which bulged slightly into the anterior chamber. There were a few fine keratic precipitates. Gonioscopy revealed marked iris bulging with no angle detail visible except at the 2-o'clock position where the scleral spur could be seen. The lens, vitreous, and fundus could not be seen.

Because of the persistent elevation of tension in a quiet eye, 2-percent pilocarpine was administered. Shortly afterward the eye developed an iris bombé with an acute further rise in tension, edema of the cornea, ciliary injection, and a heavy beam in the anterior chamber. The pupil was still 2 to 3 mm. in diameter. The eye again became quiet after the instillation of atropine, although the tension remained about 40 mm. Hg, with the anterior chamber returning to an average depth. Two similar reactions to miotics were cleared by administration of atropine.

The patient's vision has been 20/90 (Snellen) for the past three months. There is a central field of about 2 to 3 degrees with a small peripheral island temporally. There has been no fall in the tension below 40 mm. Hg except when seen two months ago. The most recent gonioscopic examinations reveal an angle closed by peripheral anterior synechias except at the 2-o'clock position where the scleral spur can be seen.

This case was presented as a secondary glaucoma due to chronic iridocyclitis, possibly a sympathetic ophthalmia, with an intermittent iris bombé following the use of miotics.

Successful cyclodiathermy in seeing eyes

Dr. J. David Stratton presented two cases in which cyclodiathermy had successfully reduced the intraocular pressure below 30 mm. Hg (Schiøtz) in eyes with useful vision.

Cyclodiathermy has been advised for relief of ocular tension in high degrees of rise due to absolute glaucoma and to closure of the central retinal vein. Its use in the seeing eye has not yet been wholly accepted.

The first case was that of B. L., a white woman, aged 58 years, who was first seen in the Clinic in December, 1945, with acute narrow-angle glaucoma of the right eye of five days' duration. An iridencleisis was performed, followed four days later by a posterior fistulizing operation of Lindner. These procedures were only temporarily effective, so that one month later a cyclodialysis was done at the 10-o'clock meridian. This was effective only temporarily, and a regime of pilocarpine miosis was instituted for one month. It, too, was ineffective. Cyclodiathermy was performed on February 25, 1940, two rows of coagulation being made over the entire lower half of the globe, 4 and 6 mm. from the limbus. Corrected vision before this was: R.E., 20/200; L.E., 20/20. Tension was: R.E., 43 mm. Hg; L.E., 20 mm. When the patient was discharged, vision was: R.E., 20/200−1; L.E., 20/20. Tension was: R.E., 31 mm. Hg; L.E., 20 mm. On April 5, 1946, tension was 23 mm. Hg, soft. From that time until October, 1946, the tension ranged around 40 mm. Hg in the right eye, so that a second cyclodiathermy was advised. This was performed on October 7, 1946. Vision at that time was: R.E., 10/400; L.E., 20/40. Tension was: R.E., 39 mm. Hg; L.E., 23 mm. The operation consisted of surface coagulation of seven spots over the lower half of the globe. Vision on November 15, 1946, was: R.E., 10/500; L.E., 20/32. Tension was: R.E., 27 mm. Hg; L.E., 24 mm.

The second case was that of M. B., a

white woman, aged 66 years, who was first seen in the Clinic in April, 1946, at which time she had narrow-angle glaucoma in the right eye with neovascularization of the iris. There was a history of four months' duration of failing vision and pain in the eye. Vision was: R.E., 20/70; L.E., 20/30. Tension was: R.E., 61 mm. Hg; L.E., 20 mm. Miotic therapy failed; so, in view of the neovascularization, cyclodiathermy was performed. On April 8, 1946, two rows of 12 diathermy punctures were laid down over the lower half of the globe. This reduced the tension only temporarily. On May 6, 1946, vision in the right eye was 20/130; tension was 69 mm. Hg. Cyclodiathermy was repeated, five applications being made over the upper globe from the 11- to the 2-o'clock positions. Tension has remained soft in the right eye, and vision is 20/250. Fasting blood sugar and repeated urinalyses have failed to reveal diabetes.

Double perforation of globe with BB shot

Dr. John Thompson presented a man, aged 29 years, who was seen for the first time at the Infirmary on November 5, 1946, and complained that a BB shot had penetrated his left eye accidentally on October 12, 1946. He was seen by a downstate ophthalmologist who hospitalized and treated him with penicillin and sulfonamides for three days. X-ray pictures were taken. No surgery was performed.

When admitted to the Infirmary, examination revealed a small, circular, depressed area, 1½ mm. in diameter, at the 11-o'clock position, approximately 5 mm. from the limbus. The base of this depression was discolored with uveal pigment. There was a one-plus beam in the anterior chamber but no cells were detected. The pupil was irregular due to posterior synechias, and a massive hemorrhage was seen in the posterior segment. The eye was soft to tactile tension. Vision was light perception and faulty projection.

X-ray studies with a Comberg contact lens showed a metallic foreign body in the orbit, posterior to the globe.

Scientific program

Dr. Justin M. Donegan and Dr. William R. Thomas (by invitation) presented a paper on "Capillary Fragility, Retinal and General: Rutin Therapy." Dr. Jack Fields (by invitation) read a paper on "Ocular Complications of Mumps," which was published in the Journal, 30:591 (May) 1947.

Richard C. Gamble,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

Published Monthly by the Ophthalmic Publishing Company

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THE THIRD PAN-AMERICAN CONGRESS OF OPHTHALMOLOGY

The third congress of the Pan-American Association of Ophthalmology was held in Havana, Cuba, from January 4 to 10, 1948. The stage setting for the congress was one of great beauty and charm. The weather was kind, the occasion cheerful, the social activities were exquisite, and the scientific program was of high excellence. The experience is an unforgettable one to all of those who were fortunate to attend. The local committee, serving under the presidency of Dr. Tomas R. Yanes and the director general, Dr. Gilberto Cepero, had labored hard and long and at great expense to make the meeting a success from every viewpoint. In an endeavor of this size and importance, errors and delays are inevitable. It is evidence of the great skill and hard work of the committee that such errors were remarkably few and unimportant.

The total enrollment was 1,371. This included guests and "adherents," many of whom were beautiful, and at least 50 percent of those who attended were from the United

States. In addition to delegates from the Western Hemisphere, representatives of countries from all over the world were present and took active parts in the program.

Forty-eight courses of instruction, similar to those given during the meetings of the American Academy of Ophthalmology and Otolaryngology, were presented. Twenty-nine of these were given in English, the others in Spanish and Portuguese. A total of 144 hours of instruction was given by experienced teachers in their respective fields, and the courses were well attended. Approximately 45 scientific addresses were offered, and there were 35 "free" papers presented in addition. About 50 percent of the total were given in English and the others in French, Spanish, and Portuguese, the official languages of the congress. Many of the contributions were of great significance and value, and it is hoped that the majority of these will become available in the necessary translations to all members of the association.

The last day of the congress was designated as "Prevention of Blindness Day," and appropriate addresses were given during the morning under the able and charming presidencies of Mrs. Eleanor Brown Merrill of New York and Señora Doña Adela Formoso de Obregón Santacilia of Mexico. The medal of the National Society for the Prevention of Blindness in conjunction with the Pan-American Association of Ophthalmology was presented by Dr. Bandilio Courtis of Buenos Aires to Dr. Harry S. Gradle, formerly of Chicago, in recognition of his great service to the cause of prevention of blindness. Dr. Gradle, the president of the Pan-American Association, was regretfully unable to be present because of physical disability, and the medal was accepted in proxy by Dr. Frederick C. Cordes of San Francisco. The round medal, approximately the size of a silver dollar, is made of bronze and attached to a navy blue ribbon. On one side it reveals a figure of hands gracefully holding the sun, designed by Rockwell Kent, surrounded by the words, "National Society for the Prevention of Blindness, U. S. A." On the reverse side is a map of the Western Hemisphere and across it a scroll bearing the name of Harry S. Gradle, M.D., 1948. On the periphery is the wording, "For service in advancing eye health."

There were approximately 20 scientific exhibits displayed, each of excellent quality and a center of interest to crowds of observers. The physical arrangement of the exhibits was most attractive and satisfactory. A splendid scientific motion-picture program of some 35 titles was arranged. It was highly popular with the members and their guests. A commercial exhibit of considerable size was in evidence in front of the registration desk and included books, artificial eyes, drugs, instruments, and pieces of ophthalmic equipment, as well as the ubiquitous Coca-Cola man, whose refreshing wares slaked a thirst stimulated by excessive numbers of Daiquiri cocktails.

In a graceful ceremony on January 8th, Mrs. Helenor Wilder, representing the U. S. Army Medical Museum, presented its fine exhibit on "Unusual Tumors of the Eye" to the Department of Ophthalmology of the School of Medicine of Havana University. Likewise, the New York Eye and Ear Infirmary, through its representative, Dr. Edward Burchell, gave a collection of 100 microscopic slides, illustrative of ophthalmic pathology, to the university.

The above activities took place in the beautiful, modern Escuela de Medicina de la Universidad de La Habana. The facilities were adequate for all purposes and the arrangements were happy and spacious. Language difficulties were, of course, encountered, and many times were insurmountable. This was the only discordant note in the entire session. In justice to the local committee members, who had gone to so much expense and trouble to overcome the handicap of language difficulties, it must be said that arrangements had been made to translate the addresses and discussions onto lantern slides

through microfilm. The necessary projection apparatus did not arrive on time and their efforts and funds were wasted, which is a great pity. Much of the scientific value was thus, temporarily, lost to the members of the association.

On Sunday evening, January 4th, the formal opening of the congress took place in the beautiful National Capitol Building. His Eminence Manuel, Cardinal Arteaga y Betancourt, Archbishop of Havana, gave the invocation. The Honorable President of the Republic of Cuba, Prof. Ramon Grau San Martin, gave the official opening address to the congress. Among other addresses was that of Dr. Gilberto Cepero who introduced the official delegates from all countries to the congress. The ceremony was most colorful and impressive.

On Monday evening, January 5th, the honorary members of the association gave scientific addresses at the University of Havana. Among them were Bailliart of Paris, A. Fuchs and Lindner of Vienna, Arruga of Spain, Thiel of Germany, and Marquez of Mexico. The president of the University of Havana, Dr. Clemente Inclán Costa, opened the session; and Dr. Angel Vieta Barahona, dean of the Faculty of Medicine, closed it.

On Tuesday evening, the mayor of Havana, Dr. Nicolás Castellanos, held a gracious reception for the members and their guests in the lovely old town hall, or Municipal Palace, of Havana.

On Wednesday evening, in the impressive hall of the Academy of Sciences, a formal session was held, presided over by Dr. Jose A. Presno, the president of the Academy of Sciences. Dr. Derrick Vail of Chicago had the honor of giving the Harry S. Gradle Lecture. His assigned subject was "The Teaching of Ophthalmology," peculiarly appropriate for the first Gradle Lecture, named after that great teacher. Dr. Tomas R. Yanes presented the Pan-American Ophthalmological gold medals to Dr. William H. Crisp of Denver, and Dr. M. Uribe Troncoso of New York, for their scientific work and activities that are so important to ophthalmology of the Western Hemisphere.

In a surprise ceremony, Dr. Tomas Yanes was decorated with the flight surgeon's wings of the American Air Force, by Col. Victor A. Byrnes (MC), U. S. A., in recognition of his successful completion of the course in the U. S. School of Aviation, in 1930.

Dr. Gilberto Cepero, in an impassioned address, discussed the life of Carlos Finlay, former president of Cuba, ophthalmologist and discoverer, in 1881, of the cause of the transmission of yellow fever by Stegomyia fasciata. He pointed out in eloquent terms the fact that certain elements in North America have tended to forget Finlay's great contribution in favoring that of Reed, Carroll, Lazear, and Agramonte, who confirmed Finlay's discovery in 1900. It is just and right that this error be brought to our attention, for the name of Carlos Finlay, as a great benefactor to man, must not be forgotten or belittled. For his labor on behalf of Finlay, Dr. Cepero was decorated with the cordon of the order, Vasco Núñez de Balboa, by the government of Panama, in a colorful ceremony preceding his address.

On Thursday evening, January 8th, the National Medical College and the Medical Circle of Cuba gave a splendid buffet reception to the members and guests of the association. There was music and dancing and cheer.

On Saturday afternoon, the members enjoyed a luncheon on the terrace of the Jockey Club at the Oriental Race Track. It was an unusual sight to see so many distinguished ophthalmic surgeons thumbing through their pesos for wagers on their fancies, some of whom, surprisingly enough, won in the "Prevention of Blindness" and "Pan-American Congress of Ophthalmology" handicaps. However, as one member remarked: "It is easier to make money doing ophthalmology, but not nearly as much fun."

The final and most thrilling event that

closed a most outstanding congress was the fiesta held in the square of the cathedral flanked by old palaces of the Dons which retain, in spite of their commercial uses, the beautiful traditions of the past. In the balmy open air was set up a dancing platform and bandstand surrounded by tables. Floodlights illuminated the entire scene in unbelievable background, like a Hollywood motion picture. Many of the guests came in the colorful costumes of their countries. In the romantic atmosphere of the place, the ladies never looked lovelier nor the men more gallant, one's appetite for food and drink was sharpened, and the lavish entertainment of singing, dancing, and pantomime never could be more thoroughly appreciated nor enjoyed.

The next meeting of the association will be held in Mexico City in 1952. Dr. Conrad Berens of New York was elected president of the association. Vice-presidents were chosen from 12 of the participating countries. Dr. Thomas D. Allen (North America) and Dr. Moacyr Alvaro (South America) were elected secretaries. The president of the congress for 1952 will be chosen by his Mexican colleagues.

One's impressions of the Third Pan-American Congress of Ophthalmology are kaleidoscopic. It will take a very long time for them to be sorted out and catalogued, but the overall impression is one of great beauty, much truth, and considerable good will and pleasure.

Derrick Vail.

CORRESPONDENCE

Tracer-substance study of eye: Correction of discussion

In the December, 1947, issue of the Journal (30:1525-1526 (Dec.) 1947), there appears a discussion of the paper, "Studies on the Physiology of the Eye Using Tracer Substances," delivered at the 16th scientific meeting of the Association for Research in Ophthalmology.

Unfortunately this discussion was very poorly recorded by the stenographer, so much so that I shall have to ask for publication of the corrected text.

(Correct text of discussion, 30:1525-1526 (Dec.) 1947, Paragraphs 1 and 2.)

Dr. Vesey (New York): I would like to ask the speakers if they made any efforts to observe the route of outflow of the aqueous tracer substances from the anterior chamber.

It is today generally accepted that the route of outflow of the aqueous is through the system of Schlemm's canal via the trabecular tissue of the angle of the anterior chamber. Many arguments could be brought up against this theory, which cannot be discussed now.

Dr. Troncoso has beautifully shown that the lower animals, on which the experiments are usually carried out, do not have a structure resembling the canal of Schlemm. He showed that the Rodentia, the Ungulata, and the Carnivora do not have the canal of Schlemm, but that they have a ringlike spongy tissue in their ciliary body, which he termed the scleral sinus. He believes that this is the organ that carries the outflow of the aqueous in these animals. But, as I mentioned, many arguments could be brought up against the theory of filtration in the human eye, as it is accepted today. The experiments, however, should be carried out on Primate, whose eyes are built similarly to the human eye. If able research workers, like the ones who presented this paper, will make good efforts to observe the route of outflow, I believe our knowledge of the physiology of this very important subject would be quite a bit enhanced. I would like to hear something about that from the speakers.

Frank A. Vesey,
New York.

Predilection of left eyes for glaucoma

It was with great satisfaction that I read the comprehensive paper by J. C. Holst in the October issue of the Journal. His ap-

parently dry statistics are most stimulating and, due to the large amount of patients observed, really conclusive.

For me, the most interesting facts were those mentioned in the chapter "The first eye to be attacked." Among 1,040 glaucoma patients, Holst found 390 whose disease began in the right eye, while he found that it started in the left eye of 484; among 189 eyes presenting absolute or nearly absolute glaucoma not subjected to any operation, 87 were right eyes and 102 left eyes; among 109 patients with unilateral glaucoma, the left eye was involved in 119 cases, and the right in 77. According to Holst's cautious statement, these figures seem to indicate that the left eye is more prone to glaucoma than the right eye; for these striking differences, a tentative explanation might be suggested.

While the right innominate vein is shorter and straighter, the left one makes a longer and more bending way to reach the vena-cava-superior union. Therefore, we may expect differences in blood pressure and resistance inside the right and left jugular veins, as well as in their tributaries. Most probably, intravascular venous pressure in the left orbital veins may also be higher than in the corresponding vessels of the right side. And that may well be a contributing factor to the predilection for glaucoma in left eyes.

Similar considerations are valid for the explanation of unilateral glaucoma connected with unilateral nevus flammeus of the face, and with arteriovenous aneurysm. These facts fall well in line with an unconfirmed but interesting observation by Colomba (1938) who found increased venous-pressure values in patients suffering from primary glaucoma, and with the experimental intraocular-pressure increase following the provocative neck-compression test.

K. W. Ascher,
Cincinnati, Ohio.

BOOK REVIEWS

PRINCIPLES OF THE CONTACT LENS. By H. Treissman, M.B., B.S., F.R.C.S. (Eng.), D.O.M.S., and E. A. Plaice. St. Louis, C. V. Mosby Co. 1947. Clothbound, 88 pages, 40 illustrations. Price, not listed.

A description of the purpose and mode of action of contact lenses is adequately presented. Various types are discussed. The relative optical merits of spectacles and contact lenses are given. A resume of eye conditions in which contact glasses may possibly be used to advantage is presented optimistically. It is scarcely to be believed that all of the conditions mentioned would be suitable. Many seem rather bizarre; for example, symblepharon, pemphigus, ptosis with a crutch type of excrescence on the glass, neuroparalytic keratitis, and lagophthalmos.

A considerable part of this book is devoted to the method of testing by the ophthalmologist for a contact glass that may be used as a basis for constructing the final product. The method of making molds of such substances as Negocoll as models for contact lenses is dismissed as being inferior to that of using the contact trial case. Since molding is the method generally used in America, most United-States ophthalmologists may not be deeply interested. The now generally used plastic contact glasses, after being evaluated, are dismissed without strong recommendation.

On the whole it is questionable whether the book will be of great importance to American ophthalmologists.

Lawrence T. Post.

A SCIENTIFIC METHOD OF FITTING CONTACT LENSES. By Philip Salvatori. New York, N.Y., Philip Salvatori, 1947. 170 pages, index, and 88 illustrations. Price, not listed.

This book is an elaborate and detailed manual on the technique of the mold method

of fitting contact lenses. It should be a welcome edition to the ophthalmologist's and technician's library. The author is certain of his subject and has brought it completely up to date. The writing is concise and lucid, and the text is well illustrated. The book is not cluttered with descriptions of outmoded methods. Illustrations and descriptions of molding and final adjustment are detailed enough so that, if followed, unsatisfactory fits will be reduced to a minimum.

One criticism can be made. Encouraging technicians to mark loose or tight areas in the hope that the manufacturer can accurately relieve them is certainly misleading.

The subject of contact lenses needs continued investigation. There is further need of public education as to their usefulness. It is stressed that contact lenses will continue to be fitted but the extent to which this will be done is questioned.

Indication for contact lenses at the present time is quite definite, and many misconceptions held by the public stem from ignorance. Poor technical fittings have discouraged potential users. Those patients, who obtained contact lenses as a fad, are also a source of adverse publicity. Few from this group are willing to expend the effort required to develop a tolerance to their lenses or to try numerous solutions in order to find a suitable one.

Francis W. Parker.

CONTACT LENSES. By Theodore E. Obrig. Philadelphia, The Chilton Company, 2nd edition, 1947. 546 pages. 180 figures, bibliography, and index. Price, not listed.

The author is a recognized authority on contact lenses. He has developed many innovations and techniques and, through his teachings, has done much to popularize the use of these devices, particularly the plastic type of contact lens. His work shows evidence of much scholarship, research, and study.

Contact lenses are still in the process of evolution. It is not inconceivable that in the near future these lenses will be developed so that they can be easily fitted and comfortably worn, for as long as the individual may desire, without harm. At the present time this ideal has not been reached, although closely approached. The struggle to obtain a satisfactory solution for the "liquid lens"; that is, the part between the cornea and contact lens, is an example of the difficulties encountered. The author ably writes of these difficulties and gives an interesting history of his efforts to obtain such a liquid.

The problem of whether to use plastic material, glass, or part glass and plastic is another controversial one that is being worked over. The subject is in a healthy state of flux and has not yet settled to the bottom. Although he is the prime advocate of the molded method of manufacturing contact lenses, the author fairly discusses the contributions of other workers and their methods of fitting. This temperate and considered writing is attractive and scientific, and is quite in contrast with other volumes on the subject that have recently appeared.

The indications for contact-lens use are perhaps unduly comprehensive and enthusiastic, in view of the present state of the development. There is, however, little to quarrel about here, provided no injury to the eye will result from wearing the lens. Should the problem be solved and the ideal reached, it will make nearly obsolete, and overnight, the wearing of spectacles. The glitter, gleam, and sparkle of the human eye will be enhanced with unforeseen biologic results; and the entire male population, insofar as its eyes are concerned, will be available to destroy each other with greater efficiency in warfare.

Mr. Obrig has written an entertaining and instructive book.

Derrick Vail.

ABSTRACT DEPARTMENT

EDITED BY DR. F. HERBERT HAESSLER

Abstracts are classified under the divisions listed below. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is mentioned only in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. Anatomy, embryology, and comparative ophthalmology
2. General pathology, bacteriology, immunology
3. Vegetative physiology, biochemistry, pharmacology, toxicology
4. Physiologic optics, refraction, color vision
5. Diagnosis and therapy
6. Ocular motility
7. Conjunctiva, cornea, sclera
8. Uvea, sympathetic disease, aqueous
9. Glaucoma and ocular tension
10. Crystalline lens
11. Retina and vitreous
12. Optic nerve and chiasm
13. Neuro-ophthalmology
14. Eyeball, orbit, sinuses
15. Eyelids, lacrimal apparatus
16. Tumors
17. Injuries
18. Systemic disease and parasites
19. Congenital deformities, heredity
20. Hygiene, sociology, education, and history

3

VEGETATIVE PHYSIOLOGY, BIOCHEMISTRY, PHARMACOLOGY, TOXICOLOGY

Amsler, M. **Liquids of the eye as part of the body lacunary system.** Ann. d'ocul. 180:418-429, July, 1947.

The body space units which form the lacunary system have much in common. The interstitial tissues of the subconjunctiva and the subchoroid as well as the anterior chamber form parts of this system. These spaces contain very little protein, but carry nourishment, especially in mineral salts, to almost all parts of the body. The liquid in these spaces represents about 20 percent of the body weight and in composition is between the blood plasma and the cellular protoplasm. This lacunar fluid is especially important in the nourishment of the avascular ocular tissues, the cornea and the lens. It is an important factors in uveitis, primary glaucoma, hypertensive and diabetic retinopathies and retinal periphlebitis. In perforating wounds, ciliary permeability is tremendously increased. Eczema, bronchial asthma, epidemic hepatitis, gastric ulcer, and rheumatoid polyarthritis are among the bodily diseases in which the permeability of the blood barrier is affected.

The Tyndall phenomenon is present in the normal aqueous which demonstrates that the blood barrier is permeable to some proteins of the blood plasma. Through the intravenous injection of fluorescein, the ciliary body has been found to be the principal source of the lacunar liquid of the eye. Normally impermeable to large protein molecules, the ciliary blood barrier may permit these to pass into the aqueous under certain conditions. When ciliary permeability is altered the change is usually primarily toward augmentation. The normal albumin content of the aqueous (0.3 to 0.5 percent may be increased to 6 percent in inflammations of the anterior uvea. The aqueous closely resembles the cerebrospinal fluid in its normal composition and also in its reactions to inflammation. The cytolytic properties of the aqueous are illustrated by the frequent rapid disappearance of hypopyon. The reactions of Besredka, Bordet-Wassermann, and Chediak have repeatedly been found positive in the aqueous. The aqueous may contain: 1. blood cells, polymorphonuclear leuco-

cytes, lymphocytes, and red blood cells; 2. desquamated tissue cells of the parts surrounding the aqueous, including corneal endothelium and iris epithelium; 3. reticuloendothelial cells; 4. cells of uncertain origin, probably interstitial tissue elements including cellular debris of different sorts. All of these cells are involved in the local defense mechanism of the interior of the eye. In 20 percent of a series of cases of chronic uveitis, large reticulo-endothelial cells were found in the aqueous. Bacterial cultures of the aqueous are rarely positive. With the ultra microscope, affording a magnification of 1300 diameters, colloid particles in suspension were easily seen and an intense Brownian movement and the Tyndall reaction were observed.

Chas. A. Bahn.

Leplat, G. **Ocular reticulo-endothelial tissue.** Ann. d'ocul. **180**:385-391, July, 1947.

The reticulo-endothelial system plays an important part in the action of sulphonamids, choline and atropine as well as some infectious diseases such as tuberculosis. Among the rarer diseases which involve the eyes and in which it plays an important part are hemophilia, familial angiomotosis, and some purpuras, lymphogranuloma benign, (Besnier-Boeck-Schumann), Gaucher's disease and the syndromes of Niemann-Pick, and Hand-Schiller-Christian.

The reticulo-endothelial system includes: 1. the histiocytes which ordinarily live in loose connective tissue and include macrophages which are rarely increased in acute inflammations; 2. monocytes of the blood which can live in the vessels and become histiocytes; 3. the lining cells of the endothelial sinuses especially in the spleen and the bone-marrow; 4. reticular cells which with the reticular fibers form the reticular tissue which is found especially in the spleen, bone-marrow, and lymphatic organs; 5. the cells of Kupfer in the liver; 6. fatty histiocytes which become fat cells: 7. adventitial cells of the blood and lymph vessels; 8. other histiocytic cells located in different parts of the body which include the alveolar cells of the lung and the microglia of the nervous system.

The reticulo-endothelial system is also called the histiocytic system and the active mesenchyme. In the eye its cells are most numerous in the bulbar conjunctiva, and uvea, especially the ciliary processes, are rare in the sclerotic, and absent in the cornea, lens, retina and optic nerve. The cells may take the form of endothelial and giant cells. Their power of mobility is less important than their ability to accumulate in their cytoplasm many and varied substances including solutions and fine suspensions among which are senescent red and other cells. Histiocytic cells contain a relatively high lactic fermentative power or glycolysis which gives them an energy capacity greater than most other cells and enables them to survive in abnormal media. They play an important part in the metabolism of iron, lipids, cholesterol and vitamins C and D.

Chas. A. Bahn.

Oggioni, Gianfilippo. **Chronaximetric studies in ophthalmology.** Riv. oto-neuro-oftal. **26**:333-352, Sept.-Dec., 1946.

The writer reviews the literature on chronaxia and gives an integrated account of its significance in the understanding of ophthalmologic physiology and pathology.

Melchiore Lombardo.

Vidal, F., Brodsky, M., and Travi, O. C. **Carbaminoylcholine and ophthalmotonus.** Arch. de oftal. de Buenos Aires **21**:328, Oct.-Nov., 1946.

The authors studied the action of carbaminoylcholine on the tension of eyes with retinal angiosclerosis. The instillation of one drop of 0.33-percent solution

of carbaminoylcholine chloride preceded by two drops of desiccated ox bile in 1-percent solution bring about changes in the intraocular pressure characterized mainly by a retardation of the capillary venous drainage and a decrease or absence of the secondary fall in pressure of the veins of distribution. (Charts, bibliography.)

Plinio Montalván.

4

PHYSIOLOGIC OPTICS, REFRACTION, COLOR VISION

Boström, C. G., and Kugelberg, I. **The official methods of testing color sense in Sweden.** Ophthalmologica **114**:95-99, Aug., 1947.

As the result of actions taken by the Swedish State Department of Health, the methods of testing color sense in Sweden have become farily well standardized. All routine tests are made with two different sets of pseudo-isochromatic plates, namely the internationally known plates designed by Göthlin and Boström and a new set of plates designed by Boström and Kugelberg in 1944. This new series consists of 20 plates. Three of these show no pattern of any kind and are intended for the diagnosis of dissimulation. The other 17 plates show numbers or letters made up of two confusion colors appearing in three different brightnesses. Because of the rare occurrence and the practical insignificance of tritanomaly or tritanopia, the recognition of these conditions is not attempted. The plates are to be viewed in good daylight. Each pattern must be recognized in less than 15 seconds. The plates do not seem to fade. They are available from the Kirugiska Instrument Fabriks Aktiebolaget KIFA Stockholm.

Questionable cases are tested with an apparatus which permits the production of accurate mixtures of spectral colors.

Peter C. Kronfeld.

Carreras Matas, Marcelo. **Subjective optometry.** Arch. Soc. oft. hisp.-amer. **7**: 710-718, July, 1947.

An easy, accurate and rapid method for measuring astigmatism is described. The author's device only consists of a bicylindrical lens and a linear object test.

J. Wesley McKinney.

Esteban, Mario. **Semiologic value of the abnormal chromatic sensations.** Arch. Soc. oft. hisp.-amer. **7**:687-702, July, 1947.

The normality of the chromatic sense depends upon a perfect relation between the stimulus which comes from outside and the sensation created by it within the brain. Many times this relation is either not exact or erroneous. For a better understanding the author divides this study into three parts. (1) Imperfect chromatic perception. (2) False and erroneous chromatic perception. (3) Imaginary chromatic sensations. Each one of these divisions is illustrated with examples which make the subject more clear.

J. Wesley McKinney.

Hildreth, H. R., Meinberg, W. H., Milder, B., Post, L. T., and Sanders, T. E. **The effect of visual training on existing myopia.** Am. J. Ophth. **30**:1563-1576, Dec., 1947. (3 tables, 1 chart, 3 references.)

Paufique, Bonamour, and Cavalieri. **Black light in the fitting of contact glasses.** Ann. d'ocul. **180**:416-418, July, 1947.

After the instillation of a 2-percent fluorescein solution, the eye with the contact lens is exposed to the radiation of black light in a dark room. If the contact glass does not adhere locally no black spot is visible. If, however, there are points of pressure contact, the fluorescent film is locally interrupted, and a black spot is visible.

The lamp used is a Mazda MA 300

mercury type with a suitable transformer. The waves transmitted are between 2900 and 3200 AU and the use of this light is without danger to the eye. (4 figures.)

Chas. A. Bahn.

Sal Lence, J. **Axone communication between the centripetal and centrifugal fibers of the retina and intimate phenomena of vision.** Arch. Soc. oft. hisp.-amer. 7:683-686, July, 1947.

Among the changes produced in the retina by light stimuli are the following: visual purple is blanched, the rods become shorter and narrower and the cells of the pigment epithelium send protoplasmic processes around the rods and cones. According to the author's concept this process is a physiologic allergy. The changed visual purple is looked upon as a sensitizer which acts upon the sensory endorgans of the retina and initiates the nervous impulse which is carried to the brain over the ascending fibers of the optic nerve. In turn impulses are sent back to the retina by way of the centripetal or retinomotor fibers and these impulses produce the secondary changes in the pigment epithelium and visual cells as an allergic response.

J. Wesley McKinney.

Van Wien, Stefan. **The sodium-vapor lamp and its use for refraction.** Am. J. Ophth. 30:1527-1535, Dec., 1947. (1 figure, 2 tables, 18 references.)

5

DIAGNOSIS AND THERAPY

Bellows, J. G., and Farmer, C. J. **Streptomycin in ocular infections.** J.A.M.A. 135:491-495, Oct. 25, 1947.

The literature on the use of this drug in ocular infections is still very scanty. Though not substantiated by sufficient laboratory data those reporting their results feel that streptomycin should be added to the usual treatment because of the shorter healing time following its use. In experimental animals huge systemic doses are required to make the antibiotic detectable and even then the concentration probably is at a therapeutically inadequate level. Neurotoxic disturbances might occur if such doses were used in man. High concentrations of streptomycin in the conjunctival sac are obtainable instantaneously by instillation. Adequate concentrations in the aqueous follow the use of a wetting agent or iontophoresis in cases of abraded, infected, and even normal corneas.

Bacillus pyocyaneus was rubbed against the abraded cornea of rabbits. Streptomycin, 10,000 micrograms per cc. in isontonic salt solution was instilled three times at two-hour intervals in different rabbits two, four, six, eight, and twenty-four hours after the innoculation. When the antibiotic was used in the first six hours the infection was prevented in all animals in which the control corneas became destroyed. Streptomycin was considered unexcelled as a therapeutic agent in this type of infection.

Rabbits in which streptomycin used systemically after the vitreous had been inoculated with staphylococcus aureus were unaffected. Vitreous abscess did not form when intravitreous injections were given within six to eight hours after inoculation.

In acute and chronic conjunctivitis where known organisms were found before treatment the sacs became sterile after a few days of instillation therapy. A case of acute meningococcus conjunctivitis responded very well.

Organisms disappear rapidly in most cases of acute and chronic infections of the conjunctiva and cornea; healing generally is prompt if complicating factors are absent.

F. M. Crage.

Camera, J. A. de C. **A new ocular fixation forceps.** Arq. brasil. de oftal. **10**:64-66, 1947.

The instrument, well illustrated in the author's article, is designed to obtain episcleral or scleral fixation in such a way as to avoid rotation of the eye. It has three blades, a T-shaped central blade with two sharp points, and two lateral pointed blades which are approximated so as to grasp the central blade. All points coöperate in the grasp of the sclera.

W. H. Crisp.

Cibis, P., and Kimmig, J. **Alloplastics in ophthalmology with Supramid.** Klin. Monatsbl. f. Augenh. **112**:75-79, May, 1947.

The superpolyamid Supramid is a new thermoplastic synthetic material which has a certain resemblance to the protein molecule in chemical structure but which is resistant to protein splitting ferments. The authors used this material in 74 plastic operations in the ocular and facial region and found that in 71 cases there was healing without complications. In two-thirds of the patients the material was used for making a plastic stump after enucleation of the eye with attachment of the four recti muscles to the stump. Substitution for bony defects around the orbital rim, substitution for the zygomatic bone, support of the lower lid, and a ptosis operation comprise another third of the reported cases.

Max Hirschfelder.

Milletti, M., and Di Luca, G. **Arterial pressure of the retina and compression of common carotid artery.** Riv. oto-neuro-oftal. **22**:1-31, Jan.-Feb., 1947.

Experiments were performed by the writers on 42 subjects whose age ranged from 15 to 75 years, in order to establish the diastolic pressure in the retinal artery on compression of the ipsolateral common carotid artery. This behavior is considered a measure of the adequacy of the collateral blood supply of the brain. The writers established the retinal index of cerebral compensation according to a formula in which the normal diastolic pressure and the diastolic retinal pressure after compression for two minutes are factors. This index is applied in the prognosis of ligature of the common carotid or the choice of a method for this surgical procedure. If the index is not above 20 the cerebral compensation is good and ligature by any method is permissible. If the index varies from 20 to 50 cerebral compensation is not as good and preference should be given to those methods of ligature which cause the gradual occlusion of the vessel; if the index is above 50 the ligature may be dangerous. (Bibliography.)

Melchiore Lombardo.

Missiroli, Giuseppe. **Diagnosic and prognostic investigation with allergometry in ocular tuberculosis.** Boll. d'ocul. **26**:31-42, Jan., 1947.

Tuberculin tests were given to 309 patients with a preparation called M.D.C. terr. Instituto Carlo Forlanini, similar to our PPD. Intradermal injections were performed, using dilutions between 1:100 and 1:10,000,000. If a papule measuring more than 8 mm. in diameter was found 48 hours after the injection the reaction was considered to be positive. The diagnoses of the patients were: two Parinaud conjunctivitis, three ulcerative conjunctivitis, four deep keratitis, 14 episcleritis and scleritis, 22 choriorentinitis or choroiditis, 264 iridocyclitis and uveitis. Two tables describe the reactions grouped according to diagnosis and dilution of the tuberculin used and the course of the eye disease compared with the degree of intradermal reaction. Most of the positive reactions were found in tests with dilutions between 1:100,000 and 1:2,000,000:

some of the patients with uveitis gave positive reactions with dilutions up to 1:10,000,000. During the protracted observation, clinically improved patients showed diminishing reactivity sixteen times and stationary readings three times; those with clinical deterioration had stationary readings three times and increase of reactivity five times. In stationary cases there was no change in reactivity eight times, increase four times, and decrease of reactivity five times. K. W. Ascher.

Missiroli, Giuseppe. **Therapeutic study of ocular tuberculosis using allergometry.** Boll. d'ocul. **26**:43-53, Jan., 1947.

Thirty-two patients suffering from ocular tuberculosis were desensitized with tuberculin injections of increasing strength. The brand used was "M.D.C. terr., Instituto Carlo Forlanini." The diagnosis was uveitis in 23 patients, choroiditis in 4, episcleritis and keratitis in 2, recurrent vitreous hemorrhages in 2, and keratitis in one. The treatment was continued for 6 to 29 months. Three patients with uveitis and one with keratitis were considered to be cured; four with uveitis, one with choroiditis, one with episcleritis and keratitis, and one with vitreous hemorrhages were not; all others showed some improvement. In the favorable cases, the clinical improvement was seen to coincide with the decrease of cutaneous tuberculin reactivity; the unfavorable cases demonstrated lack of desensitization to tuberculin. (Table). K. W. Ascher.

Muhlman, V., and Lachman, R. **The methyl antigen in ophthalmology.** Arch. de oftal. de Buenos Aires **21**:334, Oct.-Nov., 1946.

After briefly describing the method of preparation of the methyl antigen, the authors discuss the frequency of ocular tuberculosis and the specific action of the antigen. It is an innocuous form of medication which produces no untoward general, local, or focal reactions and whose beneficial effects are apparent after a few injections. The treatment, however, must be carried out over a long period of time because of the transient effect of the antigen. (Bibliography.)

Plinio Montalván.

Vidal, F., Brodsky, M., and Travi, O. C. **Influence of emotion on the neurocapillary test.** Arch. de oftal. de Buenos Aires **21**: 348, Oct.-Nov., 1946.

Emotion interferes with the neurocapillary test by producing arteriolar constriction, secondary capillary activation and slight functional retardation in the venous system. (1 chart, bibliography.)

Plinio Montalván.

6

OCULAR MOTILITY

Argañaraz, Raúl. **Convergent and divergent strabismus. Esotropia and exotropia. Medical and surgical consideration.** Arch. de oftal. de Buenos Aires **21**:67, April-June, 1946.

The author discusses the different types of strabismus. Functional divergent strabismus usually begins in infancy and is accompanied by myopia in most of the cases. The anatomical factors involved make the surgical correction rather difficult. The mechanism of divergent strabismus that results from amblyopia is briefly discussed. Divergent postoperative strabismus generally appears some time after a tenotomy of the internal rectus and results from the retraction of the cut muscle. This type of strabismus is difficult to correct. Spasmodic divergent strabismus is due to spasm of the inferior oblique, and tenotomy of this muscle is the only operative procedure for correcting it. Paralytic strabismus is frequently the result of obstetrical trauma in instrumental delivery. All convergent strabismus that appears at birth is paralytic

and the external rectus is the muscle most commonly affected. In the surgical treatment the different operative procedures and their indications and contra-indications are discussed. The medical and surgical treatment of functional convergent strabismus in infancy, including the pharmacologic, optical, orthoptic and operative treatment is summarized. (Illustrations.) Plinio Montalván.

Braun-Vallon, S. **The non-operative treatment of concomitant strabismus.** Ann. d'ocul. **180**:391-403, July, 1947.

An evaluation of British and American methods are presented, based on observations by the author in both countries. Non-operative treatment is indicated in deviations of less than 25 degrees in intelligent young persons. If the amount is greater, surgical treatment may be performed either before or after nonoperative treatment which becomes an important adjunct. Generally speaking, orthoptic treatment does not justify itself if binocular vision cannot be reasonably developed in two months. Ametropia should be fully and accurately corrected. In hypermetropia with exotropia, refractive correction has but little effect on the muscular imbalance. If the accommodative factor is predominant, bifocals may be of value to the very young with alternating esotropia. Occlusion of the better seeing eye with a cover or bandage often is of value if vision is subnormal after refraction. Its value is limited especially in the very young with central scotomas which are frequently not easy to detect. Visual acuity should be observed approximately every ten days if a monocular cover is used continuously, because of functional or structural amblyopia in the covered eye. Abnormal retinal correspondence is detected preferably with the after-image test of Bielschowsky though the amblyoscope may be used. The amblyoscope's big brother is the synoptophore. Favorable cases of abnormal retinal correspondence may be greatly improved after approximately 12 treatments which require about a month. Binocular visual education includes the exercises to develop simultaneous macular perception, prolonged simultaneous macular projection, and stereoscopic fixation.

Chas. A. Bahn.

Cross, A. G. **Neuromuscular aspects in ocular sequelae of head injuries.** Tr. Ophth. Soc. U. Kingdom **65**:20-33, 1945.

The most important sign in head injury is the pupil which, having been normal immediately after the injury is found to become dilated and fixed within a short period. This is probably due to pressure on the third nerve center in the midbrain or to traction on the nerve trunk occurring on the same side of the injury at first and later on the opposite side. The Argyll-Robertson pupillary reaction may be associated with injuries which involve the base of the brain. Defects of convergence and accommodation were found frequently and were considered to be due to a lesion in the brain stem or third nerve but frequently no organic cause was present. Recovery was hastened by orthoptic treatments after the stage of fatigability was over. Abnormality of the extraocular muscles was the commonest of the sequelae. The lesion was a paralysis or paresis of one or more of the oculomotor muscles and resulted in double vision. Vertically acting muscles were found to be more commonly affected than the lateral rectus. The superior rectus was involved in 24 percent, the superior oblique in 21 percent and the lateral rectus in 11 percent of the patients with isolated muscle defects. A surgical procedure is indicated if diplopia persists for more than four months and proves a disability to the patient. (33 figures.)

Beulah Cushman.

McGuire, W. P.: **The surgical correction of paresis of the superior oblique.** Tr. Am. Ophth. Soc. **44**:527-549, 1946.

The author discusses thoroughly the anatomy, physiology, pathologic physiology, and the etiology of paresis of the superior oblique muscle. He describes an operation that is essentially a modification of Wheeler's advancement operation for paresis of the superior oblique muscle in which he resects the desired amount of the tendon, and then reattaches the cut end of the tendon to the original insertion. With adequate exposure by means of a traction suture pulling the eye down and in, the difficulties of access to the tendon are minimized. Instead of applying surgical maneuvers to opposing muscles, one should logically attack the paretic muscle itself. C. D. F. Jensen.

de Vega y Fernandez-Crespo, R. **Ocular paralysis following spinal anesthesia.** Bol. Inst. path. med. **11**:140-143, July, 1947.

A case of this unfortunate association is presented which occurred in a 24-year-old man. About a year previously a painful area developed and later a mass appeared which was diagnosed as a cyst of the internal lateral ligament of the right knee. It was readily removed under spinal anesthesia. The convalescence was without incident. Fifteen days later a sudden convergence of the left eye developed, due to a paralysis of the externus. Intensive vitamin medication, especially of the B complex was given and after two weeks recovery was complete.

Although several hundred similar cases have been reported, this complication is comparatively infrequent in the widespread use of spinal anesthesia. Novacain was employed, and its toxic action seems to have been exerted upon both the substance and central nucleus of the abducens nerve. Vitamin treatment is suggested because of its action in other types of neuritis. The dosage should be high and preferably by injection, even when no other evidences of vitamin deficiency can be discovered.

A. G. Wilde.

Weil, H. **Krecke and Donders on prisms in orthoptics.** Optician **114**:247-253, Oct. 10, 1947.

Krecke is credited with being the first to suggest prisms in orthoptic treatment. The paper, published in 1847, has never been published in English. It is in two parts—Krecke's original suggestion and a postscript by Donders.

W. Krecke. A new prismatic lens for squinters.

Squinting occurs because the eye is unable to see for lack of exercise. If the eye could be stimulated and became accustomed after adequate training to refract light rays onto corresponding points of the retina so that the visual axes approach their natural position; if one could proceed in a step by step procedure until the axes revert to their natural position; and if by use of a prism this means could be used for the adjustment of the visual axis in strabismus, then it may be expected that in time the axis will move permanently and will retain a natural position.

The squinting eye should be trained to see by covering the other eye. When sufficiently trained, the angle of squint may be measured by having the patient look at a disc placed midway between the eyes and at the greatest distance in which the patient is able to see. Prisms are then placed before the squinting eye. The lens can be mounted in a spectacle frame and worn with a plano lens for the other eye. The power of the prism is gradually reduced, until a plano lens is used and the patient is cured. The prismatic correction may be devided between both eyes to reduce chromatic aberration.

Donders, F. C. The application of

prismatic lenses to the cure of squinting physiologically tested.

When prisms are used to refract images on to nearly corresponding points on both retinas, the squinting eye will change the direction of the visual axes and merge the double images into one. There must be no paralysis, severe amblyopia or rapid fatigue of the retina. There must be good ocular motility. If one places small prisms before the eyes, the double images will merge. The prism is a means of increasing muscle activity in the opposite direction to that of the squint, for ocular gymnastics after myotomy and as an aid in proper muscle development.

Irwin E. Gaynon.

7

CONJUNCTIVA, CORNEA, SCLERA

Cuntz-Schuessler, E. **Two families with an unusual hereditary corneal dystrophy.** Klin. Monatsbl. f. Augenh. 112:70-75, May, 1947.

The author discusses the German literature on the subject of corneal dystrophy. She then discusses two patients belonging to different families who exhibited a corneal dystrophy with pathologic changes in all layers of the cornea. Other members of these two families who had a lesser degree of dystrophy had only mild changes of the endothelium, whereas the young patients described had also opacities in the interstitial parts and epithelial defects. The cases are related to the juvenile epithelial dystrophy of Kraupa and the bullous endothelial dystrophy of Schlichting.

Max Hirschfelder.

Doggart, J. H. **Modern views on and treatment of phlyctenular conjunctivitis.** Medical Press 218:275-276, Sept. 24, 1947.

Regardless of what relationship this disease has with tuberculosis, and there is much disagreement on this subject, the incidence of this form of keratitis has declined rapidly and progressively. The disease and its clinical diagnosis are described in detail. About 65 percent of the patients are girls. Relapses are the rule in neglected cases. The discussion of the etiology is concerned chiefly with tuberculosis. There is doubt in crediting the decline in the prevalence of the disease to higher nutritional standards. The ocular disease is probably an allergic manifestation of tuberculosis. Local treatment is limited to atropine, dark glasses and mercury oxycyanide. Penicillin, because of its sensitizing effect, is contraindicated. The importance of the character of food and surroundings is stressed.

Francis M. Crage.

Esterman, B., Laval, J., and Okrainetz, C. **Intraepithelial epithelioma of the cornea and conjunctiva. (Bowen's disease).** Am. J. Ophth. 30:1537-1540, Dec., 1947. (4 figures, 6 references.)

Hogan, M. J. **Conjunctivitis with membrane formation.** Am. J. Ophth. 30:1495-1510, Dec., 1947. (12 figures, 1 table, 58 references, discussion.)

Mata, Pedro. **Penicillin in the treatment of serpiginous corneal ulcer.** Arch. Soc. oft. hisp.-amer. 7:641-660, July, 1947.

The author reports in detail 30 cases of serpiginous corneal ulcer successfully treated by means of penicillin. Pure penicillin was used in instillations containing 1,000 to 10,000 units per cc. The drops were put in every half hour until the ulcer was healed and many times they were continued for three or more days afterwards. In severe cases, for instance those which were complicated with hypopyon, penicillin was given by means of iontophoresis and subconjunctival injection in doses of 2,500 to 6,000 units per cc. The iontophoresis took two to four minutes

and was repeated when necessary. At the same time large doses of vitamin C were given because of its beneficial effect upon the infection and especially the hypopyon.

J. Wesley McKinney.

Pasca, Giacomo. **Further contribution to knowledge about the so called epidemic keratoconjunctivitis, concerning a thousand more cases observed in Sassari in 1943-1944.** Boll. d'ocul. **26**:54-64, Jan., 1947.

Pasca reported previously about some cases of epidemic keratoconjunctivitis observed in Sassari, Sardinia. The present paper is a continuation and completion of this report. A much larger material (1000 patients) is used. (A graph shows the distribution of morbidity with a peak that occurred in September, October and November of 1943). Treatment consisted of the application of 2-percent solution of silver nitrate to the conjunctiva and the administration of urotropine (hexamethylentetramine) orally or parenterally. The silver salt was used every other day and in the intervals 5-percent solutions of silver protein were instilled three times a day. Conjunctival discharge disappeared within three to six days. Corneal lesions seemed to be inhibited. Where lesions showed fluorescein stain, Pasca used an eye dressing which he also recommends when there is marked chemosis but no discharge. Corneal involvement is more common in adults; of 274 patients aged less than 10 years, only 49 had corneal lesions whereas 83 of 182 patients older than 40 years had corneal lesions in 83 cases. Pasca stresses the occasional appearance of phlyctenule-like perilimbal nodules and of subconjunctival hemorrhages. Sometimes the preauricular gland was enlarged.

K. W. Ascher.

Sédan, J. **Fistulas of the cornea.** Ann. d'ocul. **180**:404-416, July, 1947.

Secondary glaucoma is the cause and not the result of obstruction to corneal fistula. Quantitative and qualitative changes in the aqueous which follow prolonged fistulization result primarily from a mild hypertensive form of uveitis. The aqueous in passing through the cornea produces a form of corneal edema in which the adjoining corneal tissue is poisoned. This predisposes to secondary glaucoma both by way of the hypertensive form of uveitis and the keratitis surrounding the fistula. The stage is thus set for actual secondary glaucoma of varying severity by any interference with the normal intraocular secretion or exit of the fluid from the eye. The same predisposition frequently results in secondary endogenous or exogenous infectious inflammations. The practical application of this concept is that all corneal tissues diseased in the above sense, must be removed to make normal, if possible, the uveal secretion and its exit from the eyeball. Four illustrative cases are cited in one of which treatment was successful. In this case all the diseased tissue surrounding the fistula was destroyed by cauterization, and the area was covered with a conjunctival flap. The author has had no experience, with keratoplasty, though he believes the same principles would apply. (4 figures.)

Chas. A. Bahn.

Vancea, P. **Role of nasopharyngeal infections in the resistance to treatment of certain cases of conjunctivitis.** Arch. d'opht. **7**:277-280, 1947.

Vancea calls attention to the problem of conjunctivitis which is either unaffected or made worse by ordinary therapeutic measures. He notes that this type of conjunctivitis is usually associated with nasopharyngeal infection; in 27 such conjunctivitides he found nasal abnormalities present in all. Appropriate treatment of the nose and nasopharynx, along with conjunctival instillations of 1-percent

resorcin or 2-percent ephedrine, led to healing in from one to four weeks. Vancea speculates on the etiological connection between the conjunctival and nasopharyngeal infections and considers bacterial allergy the probable mechanism.

Phillips Thygeson.

Walsh, F. B., and Howard, J. E. **Conjunctival and corneal lesions in hypercalcemia.** J. Clin. Endocrin. **7**:644-652, Sept., 1947.

About one-half the cases of hypercalcemia examined have shown conjunctival and corneal lesions seen only with the aid of the slitlamp. The conjunctival lesions are small glasslike crystal particles seen within the bulbar conjunctiva in the region of the palpebral fissure. Redness and irritation may occur, the latter may even be the patients' most annoying symptom. In one case of hyperparathyroidism the particles were probably calcium phosphate.

The corneal changes are grayish granular epithelial and subepithelial opacities concentric with the limbus on nasal or temporal sides or both. The opacity is densest at the periphery but may faintly involve the whole cornea. Unlike band opacity which it may sometimes resemble, these lesions of hypercalcemia have clear areas within the area of opacity. Some of these cases may have been erroneously reported as "primary" band keratitis. Arcus senilis is deeper and manifests the white limbus girdle described by Vogt.

Conjunctival deposits were seen associated only with hyperparathyroidism and vitamin D poisoning in eight out of twenty patients with hypercalcemia. Associated keratitic lesions were seen in four patients with vitamin D poisoning and renal insufficiency. Combined with the author's report is that of seven similiar findings in cases reported by Cogan and his associates. Except for the hypercalcemia the metabolism was undisturbed. Two patients with sarcoid had corneal lesions. The conjunctival lesions cleared in two cases after the hypercalcemia was corrected. The corneal lesions have been permanent. F. M. Crage.

8

UVEA, SYMPATHETIC DISEASE, AQUEOUS

Focosi, M. **An interesting case of chorioretinitis Jensen associated with interstitial keratitis.** Boll. d'ocul. **26**:1-6, Jan., 1947.

Different etiologic factors were assumed in the pathogenesis of juxtapapillary chorioretinitis (Jensen), among them tuberculosis, multiple sclerosis, unknown virus, influenza and syphilis. Focosi reports the case of a 25-year-old male patient who, during the course of a bilateral interstitial keratitis, developed a unilateral juxtapapillary retinochoroiditis. Serologically positive, the patient was considered to be a congenitally luetic individual and this disease was assumed to be the etiological factor for both the keratitis and the fundus lesion.

K. W. Ascher.

Garbino, Carlos. **Uveitis and Nicolas-Favre's disease.** Arch. de oftal. de Buenos Aires **21**:88, April-June, 1946.

In four cases of uveitis, in three of which the usual treatments were of no avail, the patients showed a positive Frei test, were treated with tartar emetic intravenously, and improved markedly. The authors, because of the Frei test, consider lymphogranuloma the etiologic agent. (Bibliography.) Plinio Montalván.

Lachman, R., and Pérez Chacón, E. **Penicillin therapy. Endogenous bilateral uveitis.** Arch. de oftal. de Buenos Aires **21**:94, April-June, 1946.

A case of bilateral uveitis with hypopion following an attack of grippe was

treated with massive doses of penicillin hypodermically. The ocular picture cleared up in a very short time. (Bibliography.)

Plinio Montalván.

Safar, K. **Iridodialysis after cataract extraction repaired by electrocoagulation.** Ophthalmologica **114**:77-80, Aug., 1947.

During a cataract operation performed (apparently in Vienna) in September, 1945, the lights went out right after the incision. As the lens capsule was grasped "in the dark," a severe hemorrhage occurred into the chamber. The surgeon let go of what he had caught with the capsule forceps and completed the extraction by performing a total iridectomy, capsulotomy with the cystotome, and expression of the nucleus. Examination of the eye three weeks later revealed an iridodialysis of 120 degrees. Five months later the iridodialysis was repaired surgically. With a small Graefe knife introduced from below through the limbus and parallel with it, a horizontal slit was made in the secondary membrane whereby a good optical opening and freeing of the dialyzed iris was accomplished. The peripheral edge of the latter was secured with a blunt iris hook, pulled into the incision and fastened there by electrocoagulation, applying the active electrode to the iris hook which at that moment was also touching the sclera. The postoperative course was uneventful. The final result was satisfactory, the corrected vision 6/24 and the dialysis only visible as a narrow, very peripheral slit on one side of the operative iris incarceration. A case of traumatic iridodialysis after contusion was treated by the same method and with the same satisfactory result. The author believes that fastening of the dialyzed iris by electrocoagulation is preferable to B. W. Key's method of fastening the iris by sutures because the former method is faster and less conducive to loss of vitreous.

Peter C. Kronfeld.

9

GLAUCOMA AND OCULAR TENSION

Goldmann, H. **The outflow pressure of the aqueous in man.** Ophthalmologica 114:81-94, Aug., 1947.

The advent of gonioscopy and the discovery of the aqueous vein have provided a valid foundation for the old hypothesis that there is a steady flow of aqueous from the anterior chamber through certain channels of exit into the anterior ciliary veins. Such a flow is dependent upon a pressure gradient between anterior chamber and anterior ciliary veins. For this pressure gradient Goldmann proposes the term outflow pressure and estimates its magnitude by exerting graduated pressure against the center of the cornea (by means of a spring dynamometer similar to the tonometer of Baillart) until an aqueous vein which is being watched under the slitlamp, shows visible dilation. In normal eyes this phenomenon occurs at dynamometer pressures from 5 to 12 grams. On one human eye with tumor but with normal anterior segment the relationship between dynamometer pressure and resulting rise in intraocular pressure was found to be linear, 1 gram of external pressure causing a rise in intraocular pressure of 1.3 mm. Hg (Schiøtz). A dynamometer pressure of 8 grams which in a given eye brings on the first visible dilation of the clear core of an aqueous vein, would then correspond to a rise of intraocular pressure of 10.4 mm. Hg. Goldmann believes that the actual outflow pressure in the normal human eye is one-half to one-fourth of the value obtained with his method and therefore uses the term "apparent" outflow pressure for the latter.

In eyes with chronic simple glaucoma with high or medically normalized tension the apparent outflow pressure is increased. In eyes with acute (narrow-angle) glaucoma in which the tension has

been normalized with miotics, the apparent outflow pressure is within normal limits. Since aqueous veins can be found in 90 percent of all human eyes, determination of the apparent outflow pressure may prove to be a quick and convenient method to diagnose early chronic simple (wide-angle) glaucoma.

Peter C. Kronfeld.

Longhena, Luisa. **Vogt's cyclodiathermy for glaucoma.** Boll.d'ocul. **26**:7-30, Jan., 1947.

Cyclodiathermypunctures were performed on 30 glaucomatous patients; on 26 on one eye each, and four on both eyes. First operations were performed in 7 cases of secondary glaucoma, 7 of absolute glaucoma, 7 of chronic simple glaucomas, 4 of chronic congestive glaucomas, 2 of hemorrhagic glaucomas, 1 of aphacic glaucoma, and 1 of glaucoma associated with nevus flammeus. As second operation, cyclodiathermy, was used on 1 eye with absolute glaucoma, 3 with chronic simple and 1 with chronic congestive glaucoma. Procedure and complications are described. Among 7 eyes suffering from secondary glaucoma, 1 showed normalization of intraocular pressure, 2 eyes maintained tolerable pressure readings with the help of miotics, and in 4 eyes surgery was repeated (two iridectomies, two enucleations). Among seven patients with absolute glaucoma normal tension was reestablished with miotics in two, some had a transient improvement of their tension, others none. The chronic simple glaucomas responded better: four eyes had normal tension with the use of miotics postoperatively, two others a lower tension than before the operation. In one eye the tension was normal for one year after operation and remained good after a second cyclodiathermy for one month only. In chronic congestive glaucoma tension became normal in only one eye. Transient ameliorations of short duration occurred in others. In hemorrhagic glaucoma the tension became normal in one eye suffering from thrombosis of the central retinal vein, and another was relieved of pain. An aphacic eye maintained normal tension after the operation. No improvement was obtained in the eye suffering from nevus-flammeus glaucoma. In three eyes previously subjected to the Lagrange operation, intraocular pressure became normal and stayed so; in one of these eyes, the cyclodiathermy had to be repeated. The author characterizes her operative results as favorable and encouraging.

K. W. Ascher.

Torres Estrada, Antonio. **Syndrome of ocular hypertension.** An. Soc. mex. de oftal. **5**:213-219, July-Sept., 1947.

The author expresses the opinion that myopia, in the course of its development, is accompanied by a more or less marked degree of ocular hypertension. He regards it as desirable to use miotics and has applied to the general ocular condition of such patients the term "ocular hypertensive syndrome." In the course of discussion, Manuel Márquez declared that he had never seen in childhood the ocular hypertensive syndrome as described by Torres Estrada, but on the contrary that hypotension rather than hypertension was practically always present in myopia. (1 diagram.)

W. H. Crisp.

Vidal, F., and Daniel, C. S. **Glaucoma and neuroarteriolar test.** Arch. de oftal. de Buenos Aires **21**:111, April-June, 1946.

In 31 patients with glaucoma, the neuroarteriolar test was positive in 27 percent, negative in 39 percent and inverted in 34 percent. This shows a manifest functional disturbance of the venous system of distribution in glaucoma. (Bibliography.)

Plinio Montalván.

Vidal, F., and Brodsky, M. **Glaucomatous iridoplegia and Argyll-Robertson**

miosis. Arch. de oftal. de Buenos Aires **21**: 123, April-June, 1946.

The authors hold that local metabolic disturbances of the smooth muscle cells of the iris give rise to changes in the size of the pupil according to the type of cells affected: miosis in Argyll-Robertson syndrome and mydriasis in acute glaucoma. (Bibliography.) Plinio Montalván.

10

CRYSTALLINE LENS

Paras, Chavero, Enrique. **Alloxanic diabetes. Experimental production of cataract.** An. Soc. mex. de oftal. **5**:225-230, July-Sept., 1947.

The present author summarizes the reports of 26 writers on the experimental production of cataract by means of alloxan, a product of uric acid which, injected into the general circulation of animals, produces a hyperglycemia of short duration followed by a more or less marked hypoglycemia. The experimental animal may also show polyuria, polydypsia, and loss of weight, and may further develop acidosis, with hypercholesterinemia, acetonemia, and reduced content of carbon dioxide. In rats, changes toward the formation of diabetic cataract can be recognized two months after administration of the drug, and complete blindness may develop by the end of four months. (References.) W. H. Crisp.

Sack, S. Senior. **Atopic cataract.** Ann. Allergy **5**:353-363, July-Aug., 1947.

The occurrence of cataract in patients afflicted with skin disorders has been known for a long time. The earliest cases were the Rothmund and Werner syndromes. In the first type, skin lesions appeared in the early months of life and cataracts between the fourth and sixth years. The skin disease was called poikiloderma atrophicans. The latter type, a scleroderma, was associated with endocrine disturbances and cataracts.

The skin lesions of these syndromes differ greatly from disseminated neurodermatitis. It is generally agreed that the latter disease belongs with atopy which is characterized by a hereditary influence on the transmission of hypersensitivity. There is often a high degree of polyvalent hypersensitiveness. The author feels that since the skin and lens are both ectodermal tissue it is believable that the lenticular tissue participates in the disease after there has been a prolonged, extensive, and hypersensitive skin inflammation. This type of lens opacity is classified as atopic cataract.

A description of theories of the mechanism of atopic cataract formation, immunology of lens protein, and the lenticular capsule follow.

The case of a girl aged 17 years is presented. She had had an extensive neurodermatitis since she was two years old and bilateral cataracts, one mature. The cataract in the eye operated upon was probably in existence for only about seven months. F. M. Crage.

Sánchez Borroto, Pedro. **Senile cataract and antireticular serum.** Rev. del Col. med. de Cienfuegos. **2**: 547-558, July-Aug., 1947.

The author has treated with antireticular serum eleven patients who had senile cataracts. Only seven were examined after the treatment. The author found no changes in the total opacifications and in the incipient cases there was some improvement. He did not arrive at any conclusions on account of the short time of observation after the treatment.

José Sáenz Canales.

Sédan, J., and Sédan-Bauby, S. **Micropuncture of hypermature cataracts not seizable with forceps.** Ophthalmologica **114**:65-67, Aug., 1947.

To make possible the grasping with for-

ceps of the capsule of swollen cataracts, the authors recommend punctures of the lens with a fine sewing needle introduced through the peripheral iridectomy. One such micropuncture relieves the pressure within the lens sufficiently to permit grasping of the capsule. With this method the authors have performed intracapsular, complete extractions in 58 percent of all their swollen intumescent or hypermature cataracts. Peter C. Kronfeld.

11

RETINA AND VITREOUS

Culler, A. M. **The etiology of hemorrhage in the ocular fundus.** J. Iowa M. Soc. 37:486-492, Nov., 1947.

The majority of retinal hemorrhages are arteriosclerotic in origin. Arterial hemorrhages ocur in atheromatous changes and septicemia. Venous hemorrhages occur in mechanical or inflammatory obstruction. Capillary hemorrhages occur in toxic states, venous obstruction, and anemias. Irwin E. Gaynon.

Doucet, M. **Surgical repair of a retinal detachment resulting from a macular hole.** Arch. d'opht. 7:284-293, 1947.

The author describes the case of a 63-year-old woman with incipient cataract, a mopia of eleven diopters, and a flat detachment of the macula with macular hole. After the external rectus had been detached the sclera was exposed at the posterior pole and a single diathermy puncture at 15 milliamperes made over the area of the hole. Reattachment of the retina was obtained.

Doucet discusses the diagnosis of central detachment and stresses the difficulties involved in closing a macular hole without damaging too extensively the macular elements. Exposure is usually obtainable by detaching one or more muscles. For orientation, Doucet believes that the limbus offers the best guide, and as to technic he cites the various methods which have been used such as the undermining operation of Lindner after scleral trepanation, surface diathermy as described by Sohby Bey, catholysis after Vogt, and penetrating diathermy. He concludes that no one method is eminently superior. Phillips Thygeson.

Fleischer, Felix. **When should one fixate the retina prophylactically?** Klin. Monatsbl. f. Augenh. 112:20-29, May, 1947.

Retinal tears can be found in the presence of an attached retina. The visual disturbances may be minimal and may only be those of "mouches volantes" or light flashes. Sometimes one does not find a tear, but can observe a spot which looks as though it might become the site of an eventual tear. This is especially the case in patients with high myopia. After a short review of the literature the author presents 18 cases of his own. In 12 of them a retinal detachment had been present or operated on in the other eye. The second eye which showed tears without detachment was operated in every case with good success. The author states that it is urgently indicated to operate on every patient who had a previous detachment in one or both eyes and who presents the picture of a tear or suspected tear without actual detachment. In other patients who have no previous history of detachment and who present a so called "latent" tear he demands close and continued observation. A prophylactic operation is indicated when subjective complaints increase the threat of an imminent detachment. These cases can be operated on with surface cautery without paracentesis which entails no risk to the eye.
Max Hirschfelder.

Galíndez Iglesias, F. **A case of Eales' disease.** Bol. Inst. path. med. 11:158-165, Aug., 1947.

A case of recurrent vitreous hemorrhage is reported. This usually occurs in males between the ages of 15 and 30 years, although it has been seen as late as 55. When it occurs late it may be associated with a thyroid disturbance. Hemorrhages of this type occur on an average of 1 in 5,000 ophthalmic patients. While the general health may appear fair, or even excellent, detailed examination will usually uncover some form of cardiovascular renal disturbance, or more often a mild type of tuberculosis. This last is shown by glandular enlargements or excessive calcification of the hilus glands. The intradermal tuberculin reaction of Mantoux will show an erythematous papule after 48 hours.

After a hemorrhage, the eye itself shows nothing beyond a diffusely stained hemorrhagic vitreous. In time the blood may be largely or completely absorbed. Then, strands characteristic of retinitis proliferans, which result from the organization of former hemorrhages can often be seen. These, if attached to the retina, can by their contraction bring about partial or even complete retinal separation.

In the case reported absorption was practically at a standstill at the end of five months. Roentgen therapy was applied over the cervical sympathetic and the eye and the exudate then became absorbed with the exception of a few strands, and the vision returned to normal. The various possible causes are discussed; the two that seem most likely are periphlebitis of the retinal vessels, and endocrine disturbances.

A. G. Wilde.

Jaeger, A. **The retinal vessels during low atmospheric pressure.** Klin. Monatsbl. f. Augenh. 112:44-48, May, 1947.

Experimental studies were made in a low pressure chamber simulating altitudes up to 20,000 feet. At 10,000 feet one observes an enlargement of the arteries and veins, mild cyanosis of the arteries and a narrowing of the bright central light reflex on the arterial vessels. In some cases a pulsation of the veins was noted at 10,000 feet. Near the macula a broadening of the branching points of the vessels seemed to exist after reaching an altitude of 10,000 feet. No explanation for this phenomenon can be given. Some persons exhibited a spasm of accommodation under the lack of oxygen in high altitudes.

Max Hirschfelder.

Kruemmel, H. **Clinical and pathologic changes in the fundus in panmyelophthisis, with a contribution to the pathogenesis of retinal detachment.** Klin. Monatsbl. f. Augenh. 112:30-44, May, 1947.

Panmyelophthisis is caused by a deterioration of the bone marrow and is characterized by an aregenerative, anhemolytic, normochrome anemia, necrotizing processes and an increased tendency to bleeding. The case history of a patient with severe fundus changes in the final stages of the disease is presented. The retina showed numerous grayish spots in its deeper layers, some of them slightly elevated. Several small individual hilly detached areas were found in the upper quadrant and necrotic areas were spread over the attached parts of the retina. Numerous hemorrhages were also present. Sections of tissue taken at autopsy showed that the detached areas were produced by a transudate between the pigment epithelium and the rod and cone layer. The large hemorrhages were in the outer and inner parts of the retina and the smaller, spot-like hemorrhages had their location in the Henle fiber layer. The present theories about the origin of retinal detachment by cystoid degeneration and subsequent rupture are critically discussed together with the subject of "detachment without tear." (18 photographs, bibliography.)

Max Hirschfelder.

Leopold, I. H., Wiley, M., and Dennis, R. **Vitreous infections and streptomycin.** Am. J. Ophth. **30**:1345-1352, Nov., 1947. (6 tables, 27 references.)

Levrat, M., and Paufique, L. **The capillary fragility test in diabetic retinitis.** Presse Méd. p. 325, May 17, 1947.

This test is made by compressing the arm of the patient with a bloodpressure cuff inflated to a pressure equal to the systolic pressure minus 20 mm. Hg. The pressure is maintained for five minutes and the number and importance of petechiae present is then expressed in terms of +, ++, or +++. The test was found to be positive in a high percentage of hypertensive patients and in patients with certain other vascular conditions without hypertension. It may appear or disappear during the course of the hypertensive disease and may have a certain prognostic value.

In 14 cases of diabetic retinitis the authors found the test to be positive. In 12 of these cases the reaction was +++. Seven of the 14 were hypertensive but in the remaining seven the systolic pressure was less than 150 mm. The authors discuss the significance of the test in relation to vascular abnormalities and conclude that in diabetic retinitis there are not only profound local vascular disturbances but also systemic vascular lesions. They suggest that the demonstration of a positive test in a diabetic may indicate an impending retinitis. Phillips Thygeson.

Lloyd, R. I. **Pseudotumors of the macula.** Tr. Am. Ophth. Soc. **44**:213-218, 1946.

The author describes various lesions he calls "pseudotumors" which characteristically affect the macular area. The initial lesion is a light colored mass of exudate in the macular area that levels out laterally and may not seem elevated unless the binocular ophthalmoscope is used. Cysts may form with clear or opaque contents. At times the initial mass may be filled with blood and resemble an angioma of the choroid. Although pseudotumor is not always the initial stage of Coats's disease, disciform degeneration of the macula or senile and presenile macular degeneration, it is probable that it often is. Hemorrhages beneath the retina are very common at some time or other during the course of the disease. The lesions may be accompanied by retinitis proliferans. High blood pressure does not seem to be a necessary part of the disease. Pseudotumors occur most commonly in older persons with marked temporal sclerosis but may occur in young patients. In the latter tuberculosis is the usual inciting cause. (5 illustrations.) C. D. F. Jensen.

Lowenstein, A. **Cushion cells in retinal pre-capillaries and capillaries.** Nature **160**:229, Aug. 16, 1947.

The author has observed large cells of the intimal layer of retinal arterioles, capillaries and venules situated mostly at vessel branches. These cells reduce the lumen to a narrow slit or occlude it completely. The protoplasm of these cells is granular and gives them a different appearance from that of the other intimal cells. These cushion cells are best seen unstained in glycerine-cleared retina with reduced illumination. They have been stained with azo-eosin in bulk. The author was unable to discover them in stained parafin sections. The dehydrating process seems to cause shrinkage which makes the cushion cells indistinguishable from other intimal cells. The author states that it is probable that these cushion cells regulate the retinal blood stream within the fine branches according to need.

Theodore M. Shapira.

Lowenstein, A. **Intramural vessels in the retina (vasa vasorum).** Nature **160**: 124, July 26, 1947.

In investigating ocular tissue of man

and animal by a clearing method during the past seven years, the author has found intramural vessels in retinal arteries and veins. They were discovered in uncut specimens and their existence was later proved by reconstruction of serial sections. Intramural vessels in the retinal wall may be parallel to the lumen, may encircle it or may be in spirals around it. They often branch and the twigs frequently reunite. So far they have not been found in the retinal vessels of young healthy human beings. Intramural vessels have been described in atheromatous coronary arteries of the heart. The purpose of these intramural retinal vessels in some cases may be to by pass an obstacle in the bloodstream, but in others the retinal arteries show hyaline sclerosis with preservation of the lumen. It is possible that in the latter case the intramural vessels act as vasa vasorum and improve the insufficient nourishment of the changed vessel wall. They are considered as part of the pattern of repair of the sclerotic process.

Theodore M. Shapira.

Puig Solanes, M. **Retinal angioscopy in essential arterial hypertension.** An. Soc. mex. de oftal. **5**:137-213, July-Sept., 1947.

This 76-page article is based upon a study of 300 clinical cases. The work was carried on at the National Institute of Cardiology and the General Hospital of Mexico. A 26-page general discussion is followed by 43 graphs, 51 statistical summaries, 5 pages of references, and conclusions. The author's experiences do not differ essentially from those of previous writers. He calls especial attention to the fact that existence of retinal vascular sclerosis in a hypertensive patient does not imply aortic sclerosis, although statistical comparison indicates that it may suggest sclerosis of the coronary system.

W. H. Crisp.

Renard, G. **Concerning ocular tuberculosis. Retinitis of Jensen.** Presse Méd. p. 376, June 4, 1947.

The author discusses endogenous lesions, particularly tuberculosis, of the retina and choroid and notes that the French school has had the merit of calling attention to the important role of syphilis but has overemphasized the frequency of syphilitic lesions. He notes that almost all cases of ocular tuberculosis occur in persons free from active pulmonary tuberculosis. In some instances the tuberculous nature of the ocular lesion is probably due to the presence of tubercles of the iris but lesions of the posterior segment are notoriously difficult to diagnose etiologically. The tuberculin test should be used with caution because of the possibility of focal reactions. Diagnosis must be made on factors such as a history of exposure to active tuberculosis and on the clinical appearance and course.

The retinitis of Jensen is a clinical entity which the author states is almost always due to tuberculosis. The typical disease is described in detail and illustrated with case reports and colored drawings.

Phillips Thygeson.

Rowen, R. E. **Roentgenographic features of metastases of a retinoblastoma to the long bones. Report of a case.** J. Bone and Joint Surg. **29**:805-806, July, 1947.

A six-year-old male Negro whose eye had been enucleated because of retinoblastoma, developed metastases in the humerus of each arm. Roentgenographic characteristics were similar to those of osteogenic sarcoma. Diagnosis was made by biopsy.

Irwin E. Gaynon.

Sená, J. A., and Cerboni, F. C. **Macular changes from observing solar eclipse.** La Semana Méd. **54**:419-429, Sept. 11, 1947.

On May 20, 1947, an eclipse of the sun was visible over an extensive zone of Ar-

gentine, and resulted in the usual large number of individuals sustaining more or less ocular injury. The author reports nine clinical cases, and refers to six others. The early fundus changes consisted of an increase in size of the central reflex, with the appearance of a dirty-yellowish-white spot, with sharp edges, standing out upon the dark red of the surrounding fovea. These objective symptoms were accompanied by a fugitive positive scotoma, which then disappeared, leaving a central scotoma which, diagnosed with a test object of 2 mm. diameter on the tangent screen, at 2 meters, had approximately the size of an Argentine centavo coin (2 cm.).

Vitamin A appeared to have some therapeutic effect on these cases. In 30 percent the objective lesions and the subjective symptoms disappeared. In the remainder there had been an evident improvement up to the last examination, although the length of time was too short to draw final conclusions. Two thirds of the cases were bilateral. (8 illustrations, references.) W. H. Crisp.

Shanno, R. L., Griffith, J. Q. Jr., and LaMotte, W. O. Jr. **Capillary fragility and capillary permeability in relation to retinal hemorrhage.** Am. J. Ophth. **30**:1556-1563, Dec., 1947. (2 tables, 7 references.)

Spaeth, E. B. **The fundus oculi in diagnosis and in prognosis.** J. Michigan St. Med. Soc. **46**:799-804, July, 1947.

The author places the ophthalmoscope second in importance to the microscope in medical diagnosis.

He presents brief descriptions of the fundus findings in syphilis and tuberculosis of the choroid, retina and optic nerve, and in panophthalmitis, toxoplasmosis, endophthalmitis, ocular complications of bacterial endocarditis, and sympathetic ophthalmia. Francis M. Crage.

Vásquez Barrière, A. **Perimetric localization of lesions of the ocular fundus.** Arq. brasil. de oftal. **10**:1-15, 1947.

The essay is devoted to localization of detachments of the retina, more particularly before operation, and largely upon the basis of Imre's calculations as modified by Stine. The latter's paper in 1930 devoted itself especially to making the necessary allowances for perspective displacement which would arise from a large protruding detachment. Vásquez Barrière particularly emphasizes the desirability of reducing the size of the retinal bleb before undertaking to localize the tear. Not only is the patient kept for some time in bed in the position which seems best suited to the particular case, but, if the settling due to rest in bed is inadequate, a small perforating diathermic puncture is made at the point corresponding to the greatest prominence of the detachment, after superficial coagulation in the same area. The author has had constructed a modification of the Schweigger hand perimeter, as used by Stine. The modified form is a tiny perimeter of 15 cm. radius, whose arc is formed by a delicate lamina 2 mm. thick by 7 mm. wide. In the center of the arc there is a small circular mirror in which, if the vision is adequate, the patient may maintain fixation by looking at his own eye. Where the vision is inadequate for this purpose, the patient looks at a lamp supplied by a dry cell contained in the handle. The author also uses an arcmeter consisting of a minute "rule" 2 mm. wide by 30 mm. long, curved so that its curvature is adapted to that of the sclerotic. (9 illustrations.) W. H. Crisp.

12

OPTIC NERVE AND CHIASM

Bartolozzi, Rafael, and Manzano, Toledo. **Anomalies of the sella turcica and**

its ophthalmologic importance. Arch. Soc. oft. hisp.-amer. 7:671-682, July, 1947.

The author is mainly interested in the study of the clinoid process of the sella turcica. The ossification of the ligaments that join the above mentioned process can produce some compression that ends in damage of the chiasm or optic nerve, which would give a fundus picture like that found in glaucoma. There is a defect of the visual field but no increased tension. Two suggestive cases are reported. (9 figures.) J. Wesley McKinney.

Eggert, W. **A case of optic atrophy in osteopetrosis (Marmorknochenkrankheit Albers-Schoenberg).** Klin. Monatsbl. f. Augenh. **112**:66-70, May, 1947.

Osteopetrosis is characterized by extensive osteosclerosis and thickening of the bones which makes a differentiation into cortex and spongy portion impossible. The bones are more fragile, an anemia is present owing to the disturbance of the bone marrow. The condition is hereditary and recessive. Optic nerve atrophy is caused by a narrowing of the optic canal without externally visible deformation of the skull. The case of an almost two-year-old child is presented. The above named findings were present plus a slight protrusion of the bulbi and nystagmus. The prognosis is bad. The disease leads to complete blindness or a fatal anemia or septicimia. Parathyroid hormone has been recommended for treatment. (2 X-ray pictures, bibliography.)

Max Hirschfelder.

13

NEURO-OPHTHALMOLOGY

Goinard, P., Larmande, A., and Descuns, P. **Reëvaluation of unilateral mydriasis as a localizing sign in head injuries.** Presse Méd. pp. 281-282, April 26, 1947.

Unilateral mydriasis as a localizing sign has fallen into unjustifiable disrepute because of confusion with mydriasis due to purely local ocular lesions. Moreover, there is common neglect of transitory unilateral mydriasis and of unilateral mydriasis which later becomes bilateral. In a study of 40 cases in which the nature of the lesion was determined by operation or by autopsy the authors found unilateral mydriasis to be an accurate indication of homolateral disturbance of the brain due to a subdural hemorrhage, serous meningitis, or edema. Its occurrence, they conclude, even when only transitory, is an alarming sign although not by itself to be considered an indication for surgery. The article is documented with short case reports. Phillips Thygeson.

Govan, C. D. Jr., and Walsh, F. B. **Symptomatology of subdural hematoma in infants and in adults.** Arch. Ophth. **37**: 701-715, June, 1947.

It is noteworthy that subdural hematoma occurs most frequently before two years of age and again in the third, fourth, fifth, sixth and seventh decades of life. This study is based on the findings in 36 infants and 54 adults. The symptoms of subdural hematoma in adults are quite different from those which occur in infants. Convulsions were present in 28 infants and only 2 adults. Vomiting was present in half of the infants and one third of the adults. Drowsiness and coma were common symptoms in both groups. In infants, when the fontanel was open, bulging almost always occurred and the spinal fluid invariably contained blood or was xanthochromic. In the great majority of adults, the spinal fluid was normal.

The eye findings are discussed in some detail. Papilledema was found in approximately 17 percent of both adults and infants. In infants, but not adults, the papilledema was almost invariably associated with subhyaloid retinal hemorrhages. Dilatation of the pupil on the side of the lesion is an important diagnostic sign.

The hematoma is usually bilateral in infants and results in bilateral pupillary dilatation. Visual field defects were observed in a majority of the patients.

Differences in the anatomic arrangement of the membranes of the brain in the infant and in the adult probably explain the differences in symptomatology and require further study. There is an important difference between the supporting structures of the pial veins of the infant and those of the adult. In sharp contrast to the condition seen in the infant, the dura and the arachnoid membrane of the adult are firmly bound together in the region of the longitudinal sinus.

John C. Long.

Jefferson, Geoffrey. **Isolated oculomotor palsy caused by intracranial aneurysm.** Proc. Roy. Soc. Med. **40**:419-432, June, 1947.

Fifty-five of the author's own cases of "circle of Willis" aneurysm associated with isolated third nerve palsy are discussed. Two of them are described in considerable detail. The majority of the aneurysms arose from the internal carotid after the dura was pierced (suprachnoid). Subarachnoid bleeding had occurred in two-thirds of the cases.

The essential early signs and symptoms noted were ptosis, severe frontal and ocular pain, diplopia, and fixed dilatation of the pupil—all on the affected side. The changes in these manifestations during the course of the disease are described in detail. The cases are tabulated as to age, sex, subarachnoid hemorrhage, angiography, surgical treatment and present state.

The author differentiates the condition from palsies resulting from other causes by the fact that there is sudden, complete, uncomplicated third nerve palsy with severe pain involving the first division of the trigeminal nerve. He considers angiography as the best aid to diagnosis of the size, shape, position, and origin of the aneurysm. The most satisfactory, reasonably safe treatment is carotid ligature. Nineteen patients survived ligation; one of these died after seven years.

Francis M. Crage.

Just Tiscornia, Benito. **The neurocapillary test in a doubtful case of disturbance of the cerebral circulation.** Arch. de oftal. de Buenos Aires **21**:339, Oct.-Nov., 1946.

The author presents a case of disturbance of the cerebral circulation due either to an intracranial aneurysm or to an angioma of the brain cortex in the area of the internal carotid artery. The neurocapillary test of Vidal and Malbrán revealed a marked metabolic disturbance of the eye which was not shown by other methods of examination and which improved after ligation of the carotid artery of the affected side. (Charts, bibliography.) Plinio Montalván.

Solnitzky, Otmar. **Oculomotor nerve paralysis.** Bull. Georgetown Univ. Med. Center **3**:123-128, Oct.-Nov., 1947.

The oculomotor nerve, next to the abducens, is the most frequently involved of the nerves innervating the ocular muscles. Unlike the two other motor ocular nerves, the third supplies both the voluntary somatic muscles and smooth involuntary muscles.

The author gives a detailed description of the anatomy of the third nerve back to its origin in the brain and presents a case of complex third nerve paralysis. He also describes the etiology, signs, and the types of the disease. F. M. Crage.

Symonds, C. P. **Visuo-sensory aspects on the ocular sequelae of head injuries.** Tr. Ophth. Soc. U. Kingdom **65**:3-19, 1945.

The author presents visual fields to depict the damage done in closed head injuries and gun shot wounds in anatomi-

cal order. Injuries to the optic nerve were found to have the force applied to the supraorbital region or the neighborhood of the external angular process on the side of the lesion. The force necessary to cause an optic nerve lesion is usually severe but it may be so directed that there is little disturbance of cerebral function. Complete loss of vision was usually reported at first in these cases, and later a partial but satisfactory recovery took place. Bitemporal field defects indicated injury to the optic chiasm in four cases. In each case violent force had been applied to the front of the head. All had had evidence of fracture involving the posterior wall of one frontal sinus and the roof of the orbit. All had anosmia. The visual fields showed bitemporal hemianopia with some macular sparing. The author concludes that the damage in both traumatic and neoplastic injury is to the vessels that supply the chiasm.

Injury to the optic tract was reported in one patient with visual field studies which afforded an example of a transient disturbance of vision which would have been dismissed as hysterical had the fields not been thoroughly examined.

Visual field study after injuries to the visual cortex in the occipital lobe supports the view that representation of macular vision is unilateral.

Visual disorientation was observed and reported in one patient. The patient sustained no loss of vision but he had difficulty in judging distance and ocular convergence was defective.

Beulah Cushman.

14

EYEBALL, ORBIT, SINUSES

Guyton, J. S., **Exophthalmos associated with endocrine dysfunction.** Texas St. J. Med. **43**:280-282, Aug., 1947.

Exophthalmos occurs oftenest in Graves' disease, in about 65 percent of the cases of primary diffuse toxic goiter, and sometimes with "spontaneous" myxedema. It can occur but is rare without thyroid disturbance. It is seldom seen with secondary (nodular) toxic goiter. The primary cause is apparently a dysfunction of the anterior pituitary, probably overproduction of the thyroid-stimulating hormone, which may cause water storage in the orbits. The exophthalmos may be bilateral or unequal to the point of seeming to be unilateral. It persists after death. There is increased water storage, with progressive hypertrophy and degeneration of the extraocular muscles, scattered lymphocytic infiltration, and progressive (permanent) fibrosis of the orbital structures. The acute or progressive stage usually lasts 6 to 24 months and is followed by regression of the edema of the lids and conjunctiva and perhaps by a slight decrease of the exophthalmos. Prophylactic treatment of suspected malignant exophthalmos should be limited to iodine therapy, if possible, as subtotal thyroidectomy and thiouracil often cause an increase in the exophthalmos. If decompression is necessary, the subzygomatic or temporal fossa type, previously described by the author, is the least dangerous and leaves no scar or other cosmetic defect. (References.)

Bennett W. Muir.

Jaensch, P. A. **Pneumatocele of the orbit.** Klin. Monatsbl. f. Augenh. **112**:62-65, May, 1947.

A bomb splinter injury produced, aside from a destructive vitreus hemorrhage, the clinical picture of proptosis, lid swelling, limited motion of the eyeball and high fever. This picture developed over a period of four weeks and a subperiosteal abscess was suspected. Incision was followed by escape of air and the exophthalmus disappeared only temporarily. Further investigation showed that a piece of mortar had made a communication be-

tween the frontal sinus and the orbit and had become lodged in the orbit behind the bulbus. The disturbance healed after evacuation of the frontal and ethmoid sinuses with subsequent splitting of the periorbit and removal of the foreign body. (4 Figures). Max Hirschfelder.

Joly, J. P. **Diagnosis and treatment of a varix of the angular vein.** Arch. d'opht. 7:281-283, 1947.

Joly describes the case of a 38-year-old woman whose initial complaint was of a swelling over the right lacrimal region. The swelling was found to increase when the patient inclined her head laterally, or laughed, cried, or indulged in strenuous effort of any kind. It never became red or painful and the swelling was soft and reducible with pressure. It had no connection with the lacrimal sac and was accentuated by pressure over the facial vein or over the jugular vein. There was no bruit such as would be present in arteriovenous aneurysm. The condition was diagnosed as varicosity of the angular vein and treated by ligation of the vein above the tumor. There was complete disappearance of all swelling.

Phillips Thygeson.

O'Brien, C. S., Allen, J. H., and Allen, L. **Evisceration with intrascleral implant.** Tr. Am. Ophth. Soc. 44:296-303, 1946.

Preliminary work on a new method of prosthesis insertion with intrascleral implantation following viscerations is presented. Several methods of utilizing a special lucite implant with a flanged hollow peg projecting from the anterior surface for attachment of a plastic prosthesis with a pin on its posterior surface have been discarded in favor of a new technique that permits retention of all of the corneal tissue except a small central disc which is removed by a trephine for passage of the implant peg. A long meridional incision that extends backward from the limbus in the area between the lateral and superior rectus muscles is made through the conjunctiva and sclera. Through this scleral opening the intraocular structures are expressed and the implant is inserted. The prosthesis fits securely on the implant peg. The authors believe that the operation is in its formative stage. The advantages of this method over the Ruedeman procedure are listed. C. D. F. Jensen.

Offret, G., and Meaux, J. **Pseudosinusitis of the newborn and infant.** Arch. d'opht. 7:250-276, 1947.

The authors describe the acute inflammatory rhinitis accompanied by ocular signs which appears as a sinusitis but is in reality an osteomyelitis of the maxillary bone. Two cases are reported. The first, in a child of 18 months, was characterized by an edema of one side of the face with a fever of 40° C. Later a fistula opened on the lower lid and two alveolar fistulas developed in the mouth. Sulfonamide therapy led to healing of the palpebral fistula but the alveolar fistulas persisted.

In the second case, an infant of six weeks when first seen had an intense edema of both lids on the left side which extended over the cheek. There was an ulcerative lesion of the upper lid and a slight exophthalmos. An alveolar fistula was also present and pus from this yielded streptococci on culture. A small sequestrum was removed from this fistula. On penicillin therapy the ocular signs disappeared but the osteomyelitis of the maxilla failed to heal.

The syndrome of pseudosinusitis is described as having a septicemic phase and a phase of localization. In the phase of localization the ocular signs dominate the clinical picture. The authors review the ocular, nasal, and buccal signs and symptoms in the light of their own two cases and a hundred cases recorded in the litera-

ture. They conclude that the prognosis is grave, death occurring in 70 to 80 percent of the patients. The differential diagnosis and pathogenesis are considered in detail. The embryology and anatomy of the infant's facial bones are considered in relation to this syndrome. The authors conclude that the alveolar surfaces of the maxilla are involved prior to nasal involvement and suggest that the condition is hematogenous in origin. They consider penicillin to be the treatment of choice.

Phyllips Thygeson.

Pentini, Gianfrancesco. **Chronic inflammation of the orbit simulating a neoplasm, pseudotumor of the optic nerve.** Riv. di oftal. **2**:37-50, Jan.-Feb., 1947.

Birch-Hirschfeld distinguished two types of these pseudotumors, one without, and one with spontaneous reduction of the masses in the orbit. Tano classified them as uncharacteristic granulomas, lymphomas and plasmocytomas. A retrobulbar lymphocytic pseudotumor 2.5 cm. in diameter and the eyeball were removed from the orbit of a 56-year-old man. Pain was observed 11 months before admission, and diplopia appeared 8 months later. Finally, an unreducible exophthalmos of 9 mm., choked disk, and vision reduced to handmovements were found. (6 illustrations, 2 pages of bibliography.)

K. W. Ascher.

Sanchez Rodriquez, A., and Barthe Postrana, E. **A study of the inflammatory processes in the ethmoid sinuses and their relation to the orbit.** Arch. Soc. oft. hisp.-amer. **7**:587-602, June, 1947.

This is an exhaustive review of the anatomy, physiology and pathologic processes of the paranasal sinuses, and of the newer concepts of the role of the sympathetic system in the pathogenesis of retrobulbar neuritis. It is emphasized that acute inflammations of the ethmoid always have orbito-ocular repercussions; that acute exacerbations of chronic ethmoiditis are associated with oculo-orbital symptoms; that chronic ethmoidal cellulitis and such processes as a mucocele are followed by signs of inflammation or compression of the orbit and its contents. The embryology, anatomy, pathology, and surgical experience justify the conclusion that with the exception of a dentigenous maxillary sinusitis the ethmoid sinuses are the primary site of all nasal infection, and the source of all orbital complications. It is hoped that further studies of morbid processes in the nasal mucosa will reveal the relation between latent ethmoiditis and retrobulbar neuritis. It is pointed out that orbital cellulitis and orbital abscess require a different therapeutic pattern. Orbital cellulitis may resolve under medical and physical therapy. Orbital abscess calls for prompt and radical surgical intervention. (9 figures.)

Ray K. Daily.

Simonelli, Mario. **Orbital apex syndrome and generalized neurofibromatosis.** Riv. oto-neuro-oftal. **21**:245-257, Sept.-Dec., 1946.

Hysterectomy had been done on a single woman, 54 years of age, because of multiple uterine fibromata about a year before the examination. Ocular symptoms had started a few months later when diplopia developed and was followed by total right ophthalmoplegia, gradual blindness and symptoms of involvement of the ophthalmic branch of the right trigeminal nerve. Exophthalmos was present and excursion of the eyeball abolished. X-ray films showed the right optic foramen to be of normal form and size but there was clouding in the region corresponding to the upper sphenoidal fissure. When subcutaneous fibromatous nodules appeared a diagnosis of Recklinghausen's disease was made. The ocular symptoms

were ascribed to the localization of a nodule at the right orbital apex. The interpretation of the symptoms is discussed at length. (3 figures, bibliography.)

Melchiore Lombardo.

Šuster, Michal. **The treatment of rhinogenous orbital inflammations.** Bratislavské Lekárske Listy **27**:674-691, Sept., 1947.

The author describes nine patients who had rhinogenous orbital inflammations. In four of these the process was chiefly subperiosteal and in five the retobulbar tissues were affected. Those of the first group improved after radical surgical operation and chemotherapy with sulfonamids and penicillin. One of them had an extradural abscess, the only intracranial complication in the series. Three of the patients with retobulbar inflammation lost vision, two because of retrobulbar neuritis and one from iridocyclitis.

In eight cases the radical operation was performed (six according to the method of Riedl, two external ethmoidectomy). All patients were given sulfonamids and penicillin and one who had orbital cellulitis recovered without the help of surgery. The results obtained from chemotherapy alone are no doubt remarkable, but early operation is recommended. (9 illustrations, bibliography.) F. H. Haessler.

Titche, L. L. **Metastatic fusospirochetal abscess of the orbit.** Am. J. Ophth. **30**: 1427-1428, Nov., 1947.

15

EYELIDS, LACRIMAL APPARATUS

Beiras García, A. **Conjuctivitis sicca and filamentous keratitis in Sjögren's syndrome.** Arch. Soc. oft. hisp-amer. **7**:541-552, June, 1947.

The author reports a case of Sjögren's syndrome, with conjunctivitis sicca and filamentous keratitis of many years duration, in a woman 58 years old, who had dryness of the throat and mouth, difficulty of deglutition, and dryness of the joints. The eye symptoms were completely relieved by closing the lacrimal canaliculi by diathermy-coagulation. The literature on both affections is reviewed, and it is believed that the filamentous keratitis is a direct result of the abolition of lacrimal secretion. Ray K. Daily.

Fox, S. A. **Some methods of lid repair and reconstruction. IV. Total reconstruction of the upper lid.** Am. J. Ophth. **30**: 1413-1415, Nov., 1947. (6 figures.)

Gots, J. G., Thygeson, P., and Waisman, M. **Observations on Pityrosporum ovale in seborrheic blepharitis and conjunctivitis.** Am. J. Ophth. **30**:1485-1494, Dec., 1947. (4 figures, 7 references.)

Jona, S. **Amyloid degeneration of the upper eyelids.** Rassegna ital. d'ottal. **16**: 270-282, July-Aug., 1947.

Fifteen years ago a woman, now 68 years of age, noted slight ptosis, which eventually became almost complete. The skin of the upper eyelids became stiff and discolored. The affected tissue was removed, and areas of hyaloid, amyloid and colloid degeneration were microscopically demonstrable. The author suggests the name paraamyloidosis for the condition. (6 figures.) Eugene M. Blake.

Marín Amat, M. **Surgery of entropion of the upper lid.** Arch. Soc. oft. hisp.-amer. **7**:603-610, June, 1947.

The author describes a modification of the Panas operation for entropion of the upper lid. An experience with five thousand operations convinced him of its effectiveness. The modification consists essentially in superimposing the lower lid margin over the upper half of the tarsus, and thus lifting the eyelashes away from

the cornea; in excising the exposed fibers of the orbicularis; and in thinning the upper half of the tarsus. The technique of the operation is well illustrated. In local anesthesia an incision of the skin and orbicularis is made 2 mm. from the palpebral border along the entire length of the lid, the presenting fibers of the orbicularis are resected, and the tarsus is incised 1.5 mm. from the palpebral border, through its entire length. The thickened tarsus is thinned by shaving off layers of it with a thin knife. The ciliary border is superimposed over the superior portion of the tarsus, and fastened in place with fine silk sutures. (7 illustrations.)

Ray K. Daily.

Rolett, D. M. **Epidermoid cysts of lacrimal gland and caruncle.** Am. J. Ophth. **30**: 1577-1580, Dec., 1947. (1 table, 3 figures, 8 references.)

Semeraro, Edmundo. **Surgical treatment of entropion.** Rev. brasil. de oftal. **6**:37-39, Sept., 1947.

The author illustrates, and briefly describes, the following technique. A fold of skin is grasped with forceps, sufficient to give the appearance of correcting the entropion, and the upper blade of the forceps is applied 6 mm. below the lid margin. Two curvilinear incisions are made in the skin. Their centers coincide with the positions at which the blades of the forceps were applied, and the ends of the two incisions come together so as to include an area of skin that resembles the cross section of a concave convex meniscus. After this area of skin has been removed, the area of skin between the upper incision and the lid margin is dissected free from the underlying tissue, and the lower edge of this marginal flap is sutured to the skin at the lower edge of the previously denuded area. (3 drawings.)

W. H. Crisp.

16

TUMORS

Santoni, A. **Further contribution to the study of the optic nerve tumors.** Riv. oto-neuro-oftal. **21**:258-277, Sept.-Dec., 1946.

Progressive protrusion of the right eye, straight forward with a slight deviation outward was noted in a girl, 13 years of age. The eye had been always blind, the pupil did not react to light and the disc was atrophic. On the X-ray film the right optic foramen appeared to be almost three times as large as the left one. An infero-temporal orbitotomy revealed a neoplasm, 9 to 12 mm. in diameter, connected with the optic nerve. The tumor was excised and found to be an astrocytoma. In about a year the tumor recurred. The orbit was exposed by a Krönlein operation and all neoplastic masses were removed. No relapse has been noted after two years. (4 figures, bibliography.)

Melchiore Lombardo.

17

INJURIES

Aranha de Azevedo, Paulo. **Ocular changes and pregnancy.** Arq. brasil. de oftal. **10**:47-64, 1947.

The author summarizes the changes recorded and discussed by various writers as having occurred during pregnancy, at labor, and during the puerperium, including changes manifested directly in special ocular tissues, or through the function of vision as dependent upon the general circulation or the central nervous system. (References.)

W. H. Crisp.

Araujo, Helio de. **Ocular lesions from the stings of hymenoptera.** Arq. brazil. de oftal. **9**: 140-143, 1946.

Thirteen cases are briefly reported. Except in cases arising from attacks by swarms, the symptoms were exclusively

local, chiefly in the form of palpebral edema and reactions of the cornea or conjunctiva. Recovery was complete under various forms of treatment, and it may be concluded that the stings of hymenoptera are not malignant.

W. H. Crisp.

Arriaga Cantellera, José. **Craniofacial traumatism with keratitis neuroparalytica.** Arch. Soc. oft. hisp.-amer. **7**:661-670, July, 1947.

The patient suffered a traumatic injury on the left temporomalar region which produced fracture of the left malar and left superior maxillary bones. From the clinical standpoint a diagnosis of fracture of the base of the skull (greater wing of sphenoid) was made in spite of the fact that no X-ray pictures were taken. The right eye was normal; the left had light perception only. There was complete anesthesia of the cornea, the lower one-half of which was occupied by a large ulcer. Paralytic convergent squint and legophthalmos were noted. The injured nerves were found to be the left facial, the left abducens and the first and second branches of the left trigeminus.

J. Wesley McKinney.

Droegemueller, W. H. **The X-ray localization of intraocular foreign bodies.** Tr. Am. Acad. Ophth. **51**:601-603, July-Aug., 1947.

Among the potential causes of error in the Sweet method, Comberg contact lens technique, or sutured markers are differences in relationship between the foreign body and the orientation marking device. These differences may be due to slight head or eye movements as well as difficulties in transposing the charted data to the eyeball proper. The pin point localization of Struble is based on an X-ray plate taken after suturing a small shaving of lead to the eyeball near the site of the foreign body previously indicated in lateral as well as anteroposterior roentgengrams. Accurate localization makes possible minimum trauma during the extraction. Negative X-ray reports should never be taken as proof of the absence of intraocular foreign bodys when other clinical evidence indicates its presence. The Berman and other localizers do not indicate site as accurately as the X-ray. The bone-free method of Vogt, parallax air injection studies, as well as the use of stereoscopic plates are briefly discussed.

Chas. A. Bahn.

Gundersen, Trygve. **Surgery of intraocular foreign bodies.** Tr. Am. Acad. Ophth. **51**:604-613, July-Aug., 1947.

Ocular casualties are ten times more frequent than size of the ocular area leads one to suspect. The eyes expose only 0.2 percent of the body surface, yet ocular casualties constituted almost 3.5 percent of all battle casualties in the sixth General Hospital between March, 1943 and December, 1944. Very small high velocity fragments cause greater ocular damage than would be expected because of their explosive action within the tissues. Multiple foreign body injuries were surprisingly frequent and were observed with a single wound of entrance. Locators that are designed on the same principle as mine detectors frequently accurately indicate the nearest approach to intraocular foreign bodies. Locators give no information which cannot be obtained by precise X-ray examination. The weakest magnetic force possible should always be used in the removal of intraocular foreign bodies. In World War II, the Lancaster hand magnet was most generally used. Routine procedures in ophthalmic military surgery should be avoided because each case presents individual problems. Immediate enucleation should be performed only if it is a part of a general debride-

ment. Differentiation between hemorrhage in the vitreous and in the subchoroidal space is important and can be made by means of visual fields taken with point illumination of low intensity. Secondary foreign bodies such as paint and lashes were frequent and of practical importance. Generally speaking, the toxicity of metallic intraocular foreign bodies is inversely proportionate to their atomic weight. In the removal of intraocular foreign bodies, the trauma involved frequently determines the fate of the eye. Localization must often be of pin point accuracy to avoid calamity. Prompt sulfonamide administration has so reduced the risks of immediate infection that one can take time for accurate diagnosis. The advantages and disadvantages of the anterior and posterior routes are briefly reviewed. The former is less desirable for large foreign bodies which may damage the zonule. To avoid sympathetic ophthalmia necessary enucleations should be performed by the twelfth day.

Chas. A. Bahn.

Nüranen, J. V. **The Navy's plastic ocular restoration.** Military Surg. **100**: 402-406, May, 1947.

The paper gives a short history of artificial eyes, the advantages and shortcomings of plastic restorations, the advantages of an individual prosthesis over the conventional stock type, and an explanation as to "why dentistry is the logical profession to undertake this individual prosthesis." Techniques are not described.

In preparing an ocular prosthesis a dental officer is the logical operator to take the impression because of the emphasis placed on the anatomy and physiology of the head and because of his understanding of the physiology, asepsis, and esthetics involved in the problem of dental prosthetics. Francis M. Crage.

Struble, G. C. **Experimental work on intraocular foreign bodies.** Tr. Am. Acad. Ophth. **51**:594-600, July-Aug., 1947.

Steel shavings of different sizes, freshly killed pig's eyes and the blunt tip of the giant magnet were used in this experimental work to determine at what distances various sized particles can be drawn through vitreous and uvea and through a scleral incision. The success of the extraction on the first application of the magnet depends on the initial impact of the foreign body on the inner layers of the globe. In these experiments magnetic foreign bodies were in one of four positions: 1. free in the vitreous; 2. imbedded in the retina; 3. between the retina and the choroid; 4. between the choroid and sclera. In position 1 only particles larger than 1 mm. could be consistently brought forward; in position 2, only particles larger than 1 mm. could be disengaged and brought forward and delivered through the ciliary body and anterior chamber; and in position 3, only particles 1.5 mm. or larger could always be delivered. In position 4, 1.5 mm. objects produced choroidal separation and retinal elevation, but in no instance was the retina or choroid prolapsed when the foreign body was delivered. (5 tables.)

Chas. A. Bahn.

Wilder, H. C. **Intraocular foreign bodies in soldiers.** Tr. Am. Acad. Ophth. **51**:585-593, July-Aug., 1947.

In military injuries, non-magnetic intraocular foreign bodies predominate by more than 25 percent. In this microscopic study of almost 4,000 enucleated eyes during World War II, more than 18 percent had retained foreign bodies. Among the non-magnetic substances found were copper, brass, lead, nickel, zinc alloys, glass, vegetable matter, eye lashes, shale and clay. Sympathetic uveitis was found in 0.1 percent. Glaucoma was comparatively rare and phthisis bulbi was frequent. The

figures excellently illustrate the basic pathologic process involved. (35 figures.)

Chas. A. Bahn.

18

SYSTEMIC DISEASE AND PARASITES

Alvarez, W. C. **Psychosomatic medicine that every physician should know.** J.A.M.A. **135**:704-708, Nov. 15, 1947.

In an address which the ophthalmologist will read with pleasure and profit, Alvarez points out that every physician must know much about psychosomatic medicine if he is to avoid making many diagnostic mistakes. One should learn to recognize quickly those syndromes which are probably always functional in origin and learn when to suspect that a patient's main trouble is a nervous breakdown or fatigue state. One of the best signs is an inability to work comfortably, if at all. Another good sign is the inability to read. The patient says his eyes quickly tire; he gets tense, his head feels as if gripped in a tight band; he reads a paragraph over and over again and gets little out of it. Usually he cannot sleep, and he is irritable and overemotional.

F. H. Haessler.

Appelbaum, Alfred. **Human toxoplasmosis.** West. Med. and Surg. **1**:323-331, Oct., 1947.

The author reviews the literature on toxoplasmosis and presents the record of an adult in whom the diagnosis of the disease was confirmed by a positive neutralizing antibody test. A classification of all types of toxoplasmosis is listed. Ocular defects have been observed in more than half the cases and the finding of bilateral central chorioretinitis suggested the proper diagnosis. The general pathological findings are presented and the laboratory procedures for diagnosis have been found to be quite accurate.

The symptoms in infants may include cranial anomalies, convulsions, cerebral calcification and mental retardation. Adults with acute febrile debilitating conditions with erruptions or atypical pneumonia may be found to have toxoplasmosis.

O. H. Ellis.

Carreras Durán, B. **Ocular manifestations in congenital porphyrinuria.** Arch. Soc. oft. hisp-amer. **7**:459-468, May, 1947.

A case of congenital porphyrinuria is reported in which the ocular lesions were localized in the cornea, conjunctiva, sclera and episclera in a man, 49 years old. Since the age of 8 years he had had skin ulcerations especially in the ears, and on the hands and face where scars are still visible. He had bilateral conjunctivitis and conjunctival scars from an old ulceration, bilateral holes in the sclera about 2 mm. in diameter which are covered by the bulbar conjunctiva and a dense leukoma in the left cornea. There is a history of the same disease in two members of his family. Van der Hoeve called this disease scleromalacia perforans and reported nine cases. (2 illustrations.)

J. Wesley McKinney.

Cohen, Martin. **Ophthalmoscopic changes associated with hypertensive vascular disease as a guide to sympathectomy.** Arch. Ophth. **37**:491-496, April, 1947.

In 82 patients with benign essential hypertension no progression of the retinal lesion was observed after sympathectomy. Of 60 patients with associated hypertension with mild or moderate retinal lesions, regression of the retinal hemorrhages, exudates and edema were observed in 22 after sympathectomy; but the basic underlying retinal arteriolar sclerosis remained unchanged in 48. Retinal angiospasm was relieved in 12 patients.

Patients with benign essential hypertension and eyegrounds that are normal or have moderate lesions are suitable for

sympathectomy if continued medical treatment is of no avail in alleviating the severe and persisting subjective symptoms. The advisability of sympathectomy is determined primarily by the internist, whose decision is based on the consideration of all clinical data in essential hypertension. John C. Long.

Cordes, F. C., and Aiken, S. D. **Ocular changes in acute disseminated lupus erythematosus. Report of a case with microscopic findings.** Am. J. Ophth. **30**:1541-1555, Dec., 1947. (11 figures, 29 references.)

Edson Pinho. **Hysteric amaurosis.** Arq. brasil. de oftal. **10**:16-19, 1947.

The patient was a white woman, aged 19 years, who had been married for ten months and had a healthy girl aged one month. The eyes were apparently normal, but no form of mental or physical treatment restored her vision until her husband returned from prison.

W. H. Crisp.

Givner, Isadore. **The eye in diabetes.** Am. J. Digest. Dis. **14**:258-260, Aug., 1947.

The author discusses the views of many ophthalmologists on the hemorrhagic and exudative changes in the retina of the diabetic. Cataract is more prevalent in the diabetic patient but a true diabetic cataract exists only in the juvenile type and is manifested by subcapsular opacification. Capillary fragility has been seen to become worse after the administration of vitamin P, and hemorrhages continue despite the use of rutin. The author encourages a more thorough study of the conjunctival vessels since he found phlebosclerosis in an aqueous vein of a patient with retinal phlebosclerosis. The diabetes had existed for 17 years. Not infrequently the vessels of the plica are dilated when the remainder of the conjunctiva is normal.

A new classification for hemorrhages and one for exudates is suggested, also a record chart for diabetics. The author feels that newer instruments and newer interpretations of physiopathology in diabetes should help to harmonize the findings with the more modern concepts of the disease. F. M. Crage.

Grammatico, A. D. **Concerning a case of neurocirculatory asthenia of the eye.** Arch. de oft. de Buenos Aires **21**:97, April-June, 1946.

Many cases of asthenopia, not improved by the correction of refractive errors or the removal of the foci of infection, are due to neurocirculatory asthenia of the eye, characterized by an altered arteriovenous relation, contraction of the visual field, low intraocular pressure, bradicoria, intolerance to parasympathomimetic drugs and somatic and hemotologic changes. A definite improvement is obtained by the instillation of L-alphaphenyl-betamethyl-aminopropanol sulphate in 5-percent solution, a diet rich in acid ash and thyroid therapy. The treatment is controlled by frequent examination of the visual fields, which show marked improvement. The intraocular pressure remains unchanged. (Bibliography.)

Plinio Montalván.

Hallum, A. V. **Changes in retinal arterioles associated with the hypertensions of pregnancy.** Arch. Ophth. **37**:472-490, April, 1947. (See Section 11.)

Holden, F. A. **Migraine as seen by the ophthalmologist.** South. Med. J. **40**:757-760, Sept., 1947.

Although the cause of migraine is unknown, the author favors an allergic (food) basis. In a series of over 50 patients who had ophthalmologic symptoms,

all had a protein sensitivity especially to meat and milk. When these were removed from the diet and green vegetables were substituted the patients improved. The main characteristic is periodic paroxysmal headache, preceded by visual disturbance. The headache is usually intense and relieved by sleep. The ophthalmic type can cause permanent eye defects, particularly scotomas. In treatment, all infections are eradicated. All the author's patients showed intoxication from the gastro-intestinal tract, and were constipated. Nicotinic acid and dihydro-ergotamine also have been recommended. (References.) Bennett W. Muir.

Leroy, J. **Ocular reactions during shock treatments in neuro-psychiatry especially electro-shock.** Ann. d'ocul. **180**:342-359, June, 1947.

Five stages in the development of shock are recognized: (1) electro-spasm for several seconds; (2) a pre-convulsive phase of 10 seconds; (3) a convulsive phase of one minute; (4) a stertorous phase; (5) and a revival phase. The lid reactions include an intense contracture of the orbicularis, exophthalmos, relaxation, and lastly, lid closure without contraction. In more than 50 percent of the cases observed during the crisis, conjugate deviations of all types were observed, the corneal reflex was abolished and lacrimation increased. The pupillary diameter varied from 2 to 7 mm. and slight mydriasis existed in approximately 70 percent of the patients. Ocular tension was increased above 35 mm. Hg in 14 percent. The intravascular pressure of the retinal arteries was frequently increased temporarily by the treatment, as was the cerebrospinal pressure. Somewhat similar results were obtained with insulin and with cardiazol. Excitation of the neurovegetative centers in the hypothalamus is considered the basic process. (37 references.) Chas. A. Bahn.

Lorofi, H. **Treatment by intravenous novocaine of visual disturbances caused by tryparsamide.** Presse Méd. p. 435, (June 28) 1947.

Eleven observations are reported in which visual accidents that occurred in the course of tryparsamide therapy were treated with injections of novocaine. There were two failures, seven successes, and two improvements. In the seven cases in which the amaurosis was complete the treatment was successful in three and there was improvement in two. The injection of from six to ten cc. of 1-percent novocaine solution was reported from five to fifteen times. The first four or five injections were given daily and the remainder spaced irregularly according to the response of the patient. Positive results, when obtained, were almost immediately apparent.

Phillips Thygeson.

Pittman, H. W., Holt, L. B., and Harrell, G. T. **Effect of irradiation, immunity and other factors on vaccinial infection; a review illustrated by the report of a secondary ocular infection treated with roentgen rays.** Arch. Inter. Med. **80**:61-67, July, 1947.

A case of vaccinial infection of the lid appeared five days after vaccination against smallpox. Roentgen treatment (220r) given in four days along with other treatment helped complete recovery.

Experiments on rabbits with primary and secondary vaccinial infection showed that Roentgen therapy diminished the residual corneal opacities, hastened regression of the acute lesions, and diminished the rate of spread of the virus through tissue. The partial immunity that develops as a result of the skin vaccination helps diminish the severity of the secondary lid and corneal infection. The use of immune serum and other methods of therapy are discussed. It is believed that the former inactivates the virus,

alters its virulence, increases the resistance of the host cell, or inhibits the spread of virus through tissue.

H. C. Weinberg.

Potter, L. C. **Industrial eye surgery and treatment; mechanical approach.** Indust. Med. **16**:350-352, July, 1947.

A well organized safety department to instruct "lead men" in industrial and emergency work is paramount. The most improved fine mesh goggles with proper filter lenses are necessary. Close coöperation and coördination with the medical services and safety department to minimize injuries and accidents, and immediate treatments of the emergencies, pay big dividends in service to the employer and employee alike.

A total of 10,901 eye cases, treated according to these principles in one year was recorded by the safety department. A score of 99 percent success with no eventual loss of sight, annoying scar tissue, or chronic diseases, gives a measure of the value of the combined services. One point stands out clearer than others, namely: prompt and immediate attention to patients with accidents of the eyes and a careful and complete medical and surgical service, are a necessity.

Theodore M. Shapira.

Schnitker, M. T., and Schnitker M. A. **A clinical test for migraine.** J.A.M.A. **135**:89, Sept. 13, 1947.

The authors have developed a technic for the differentiation of two types of headaches which are very similar clinically. It has been found specific in the precipitation of a migraine attack in those who are subject to that disorder. Migraine must be differentiated from the histamin cephalalgia which follows an injection of histamin base. In migraine the pain seems to arise from stretching the cranial arteries, especially the external carotid and its branches. Histamin cephalalgia and those headaches associated with fever are due to the dilatation of the cerebral branches of the internal carotid, especially the vertebral and basilar.

Actual migraine must not be present when the test is begun, and a careful neurologic examination must first exclude intracranial lesions. After the blood pressure and pulse rate in the reclining patient have been recorded, the patient is given two 1/100-grain nitroglycerin tablets. Two to four minutes later the pulse rate will rise, but the blood pressure will drop below the resting level, and the patient will note the first migraine symptoms. The patient is then asked to compare the sensation produced by the tablets with his usual complaint. When migraine is habitually localized in one area, that area will be the first to manifest the typical pain following the nitroglycerin. A more generalized headache will follow in a few minutes.

Relief can usually be given by firm compression of the homolateral carotid artery for one to two minutes, breathing oxygen for five minutes, or injecting a solution of 0.5 to 1 mg. ergotamine tartrate intravenously. Usually the pain disappears spontaneously.

If typical migraine is not produced by the nitroglycerin, the patient rests fifteen minutes, and is then given the subcutaneous histamin test. If this produces his usual symptoms, a diagnosis of histamin cephalalgia is made. He is then given two or three minims of 1:300,000 epinephrin intravenously, and later the usual histamin desensitization procedure is carried out.

This test for migraine has been found uniformly satisfactory in over 250 cases.

A. G. Wilde.

Wagener, H. P. **Progress of medical science: Ophthalmology: ocular lesions in brucellosis.** Am. J. M. Sc. **214**:215-219, Aug., 1947.

Most cases of brucellosis reported occur in the acute stage of the disease. It may occur in the form of choked disc, optic neuritis, extraocular muscle paràlysis, uveitis, retinitis, keratoiritis, and keratoconjunctivitis. History of recurrence in the chronic forms is important. A positive skin test and an agglutination in a dilution over 1:80 is important.

Irwin E. Gaynon.

Wilhelm, G. **The participation of the eye in typhus.** Klin. Monatsbl. f. Augenh. 112:48-60, May, 1947.

The basic pathological-histological finding in typhus is connected with a vascular cell infiltration in the skin and the organs, particularily the central nervous system. The author discusses the various theories and descriptions, as found in the literature. He then presents the eye findings consisting of a conjunctivitis due to a roseola of the palpebral and bulbar conjunctiva, of a uveitis and of a papillitis. Slides are presented illustrating the histologic findings of these conditions. The optic nerve shows a diffuse increase in cells in the endoneural septi and the optic nerve sheaths. Infiltrates are found in the choroid, especially in the form of nodules of the vesel wall in the layer of the larger arteries. Nodules may also be found in the iris. Sometimes (in one third of the author's material) these nodules can be seen with the ophthalmoscope as grayish white infiltrates close to the papilla near an artery. The retina shows secondary changes through edema or circumscribed detachment, but can also be involved by primary nodules in the wall of the retinal arteries. These retinal infiltrates near an artery are also ophthalmoscopically visible. Due to venous stasis from the papillitis or from venous thrombosis small hemorrhages may occur in the nerve fiber layer of the retina. (16 photographs.)

Max Hirschfelder.

Young, R. H., and McEwen, E. G. **Bacillary dysentery as the cause of Reiter's syndrome.** J.A.M.A. 134:1456-1459, Aug. 23, 1947.

Since 1916 the triad of symptoms that consists of arthritis, conjunctivitis and urethritis has been known as Reiter's disease. The study of 176 cases of bacillary dysentery observed in Algeria revealed 14 cases of post-dysenteric arthritis. In several of them there was also conjunctivitis and urethritis and these cases fulfil the clinical requirement both of Reiter and of Fiessuege and Leroy who independently described this syndrome. In four of the six cases in which the blood was tested significantly positive agglutination titers for Shigella organisms were obtained. The authors believe that Reiter's disease is a particular combination of three of the recognized complications of bacillary dysentery.

A. G. Wilde.

19

CONGENITAL DEFORMITIES, HEREDITY

Beauvieux, M. **Apparent blindness in the newborn. Gray pseudo-atrophy of the optic nerve.** Arch. d'opht. 7:241-249, 1947.

The author reports a syndrome of apparent blindness in the prematurely newborn characterized by incoordination, absence of photomotor reflex, dilated pupils, nystagmoid movements, and depigmented fundi with mottled gray nerve heads. Although the child appears blind he later is found to have vision commensurate with his refractive error. The clinical symptoms may be of short duration and return to normal may occur within a few months.

Beauvieux considers that there are two varieties of this syndrome. In the first the return of vision is rapid (from four to six months) and is complete. In the second the clinical evolution is less satisfactory and there are numerous sequelae

such as pigmentary changes in the retina, posterior polar cataract, strabismus, nystagmus, high myopia, Little's disease, and various cerebral changes. A certain return of visual acuity is always obtained, however. As to cause, Beauvieux considers that prematurity and abnormal gestation, leading to retarded myelinization of the optic nerve and cortical fibers, are important factors.

In a follow-up study of seven cases over periods of ten years or longer, three patients were found to have normal vision and four to have reduced vision varying from 3/10 to 5/10.

Phillips Thygeson.

Cavalcanti, L. R. **Ocular changes in heredo-degenerative diseases of the nervous system.** Rev. brasil. de oftal. **6**:5-14, Sept., 1947.

This is a rather broadly generalized consideration of various diseases of the nervous system which may be represented in the eyes, with numerous brief references to the literature, but without any very precise classification or description.

W. H. Crisp.

Crespí, G. **Coloboma of the cornea.** Arch. Soc. oft. hisp.-amer. **7**:577-586, June, 1947.

A man, 26 years old, with a negative family history had bilateral, symmetrical coloboma of the cornea and iris in the lower nasal segment. It appeared as though a cone of sclera invaded the cornea for 3 to 4 mm. The pupil was oval with its axis down and in. A portion of the pectinate ligament appeared to have entered the anterior chamber in this region. The pathogenesis of these disturbances is reviewed, with special reference to a differential diagnosis of malformations originating from interference in the development of the fissure of the optic cup, and those stemming from disturbances in the facial fissure. The author attributes the malformation in his case to a developmental disturbance at the end of the cleft in the optic cup, and it is pointed out that disturbances of either fissure may cause malformations in the anterior ocular segment. (7 illustrations.) Ray K. Daily.

Sala, Guido. **The so called "Hypertelorism" of Greig.** Riv. oto-neuro-oftal. **22**:32-50, Jan.-Feb., 1947.

The writer reports two cases of Greig's hypertelorism characterized by an abnormal distance between the two eyes. This condition is frequently associated with other cranial malformations but in the Greig syndrome it is only a manifestation of an anomaly in the development of the sphenoid bone which consists in a disproportion in the growth of the great and small wings of the bone. The writer discusses briefly the probable factors in the development of the anomaly and suggests that the name be changed from hypertelorism to telophthalmus because the latter describes the clinical picture more accurately. (Bibliography.)

Melchiore Lombardo.

20

HYGIENE, SOCIOLOGY, EDUCATION, AND HISTORY

Apin, K. **The practice of trachoma control in Latvia.** Klin. Monatsbl. f. Augenh. **112**:60-62, May, 1947.

This report summarizes statistically the effect of a recent Latvian edict forcing trachoma patients to undergo treatment. Admissions of trachoma patients to eye clinics increased over 100 percent. The early stages showed a more rapid healing and less reduction in visual acuity. The patients who lived close to oculists benefited in a much higher percentage. Close cooperation between oculists and public health doctors revealed the necessity of intensive special treatment like grattage in 18 percent, surgery in 9 percent and hospital admission for a serious stage in 5

percent of the patients during field surveys. Ten percent of all trachoma patients sooner or later had a pathologic condition of the lacrimal duct, but in only five percent of the patients this was present at the first examination. Max Hirschfelder.

Hallermann, W. **The geographic distribution of ocular tuberculosis.** Klin. Monatsbl. f. Augenh. **112**:13-20, May, 1947.

In the Sanatorium Hoechenschwand 3,300 patients with clinically certain ocular tuberculosis were surveyed to determine if certain regions in Germany show a prevalence of ocular tuberculosis. It was found that the number of patients from various districts paralleled the general density of the population. Laborers and civil service workers predominated but this finding is not significant because the medical insurance plan embraces these occupations and does not cover the rural population to an equal extent. A prevalence of ocular tuberculosis in certain regions was not established.

Max Hirschfelder.

Hessberg, R. J. **Review of contributions and experiences of World War II to ophthalmology. 1. Injuries of the eyes and head.** Ophth. ibero amer. **8**:1-44 and **2**:119-175, 1946. (English and Portuguese).

This lengthy review is based on ophthalmic literature from 1939 to 1945 so far as available at the time of writing. The author reminds us that most observations were made in forward lines and in rear hospitals where the casualties could only remain for a limited time, so that the physician was rarely or never able to follow the development of the cases to the end or until complete clinical healing took place. The scope of the review may be gathered from the following section headings: statistics and first treatment, protection and prevention, special reports, perforating wounds, foreign bodies, the skeleton-free X ray, magnet tests, methods of localization, double perforation, magnets, methods of extraction and their results, contact lenses, enucleation and evisceration, stump formation, contracted socket, sympathetic ophthalmia, injuries by blasting, concussion and contusion, retinal angiopathy, orbit and sinus, pulsating exophthalmos, maxillo-facial injuries, head injuries, psychic disturbances, burns, and plastic surgery.

Most perforating injuries were due to explosions. It is generally concluded that all eye injuries should be sent to special eye departments as soon as possible, only cleaning and dressing being done at the first-aid station. Direct suture of corneal wounds is preferable. Widely gaping perforations need conjunctival flaps. Early enucleation of blind eyes is preferable to evisceration except in the presence of true panophthalmitis. The main objective in burns of the face, lids, and eyes is to prevent or limit infection as completely as possible, and grafting of the burned area is advisable at the earliest opportunity. Plastic surgery should be limited to ophthalmologists having special training for this work. (7-page bibliography.) W. H. Crisp.

Moron-Salas, José. **What can be expected from "radar" for the blind?** Arch. Soc. oft. hisp.-amer. **7**:703-709, July, 1947.

With the hope that blind people can be taught how to recognize surrounding objects even to read text books the author briefly describes his experimental work with radar. He utilizes the photoelectric cell as a fundamental base of an apparatus, which would give sounds of different characteristics according to the shape of the objects placed before it.

J. Wesley McKinney.

De Roetth, Andrew. **Blackboard cornea for teaching.** Am. J. Ophth. **30**:1299, Oct., 1947. (2 figures.)

Schepens, C. L. **Reflections on a stay in the U. S.** Ann. d'ocul. **180**:292-307, May, 1947.

The author was a guest speaker at the 1946 Academy meeting. He spoke on several occasions and presented a binocular ophthalmoscope which has been reviewed in this journal. After a brief description of the Academy meeting, Dr. Schepens described in some detail the medical and surgical advances which he observed there and while on a tour of several American ophthalmological centers. These observations included the types of vertical muscle advancements and resections, tendon transplantations of paralytic muscles, the techniques of enucleation and evisceration as well as the different substances used as implants. The author preferred the implant technique of Cutler to that of Ruedeman. Among the newer drugs described are tyrothrycin, streptomycin, streptothrycin, and the anti-glaucomatous drugs, doryl and D.F.P. The author discusses in some detail the organization of the ophthalmological department of the Mayo Clinic, and the procedures of superficial keratectomy, the radio-therapeutic treatment of vascular corneal opacities before transplantation, and round and square corneal grafts which he observed in New York.

Chas. A. Bahn.

Velter, Edmond. **Ophthalmology in France from 1939 to 1945.** Arch. de oftal. de Buenos Aires. **21**:63, April-June, 1946.

The author reviews French ophthalmology throughout the war years, emphasizing the considerable difficulties and hardships created by the dispersal of personnel and scarcity of instruments, chemicals and animals for experimental work. The restrictions on gas and electricity rendered impossible the use of apparatus and equipment. The resourcefulness, spirit of sacrifice and devotion to science of the French ophthalmologists made it possible for them to carry on to a remarkable degree clinical and experimental work under the adverse circumstances of this period. The author lists the most important papers and communications made during war years.

Plinio Montalván.

NEWS ITEMS

Edited by Donald J. Lyle, M.D.
904 Carew Tower, Cincinnati 2

News items should reach the editor by the 12th of the month

Deaths

Dr. Milton Julius Ballin, New York, New York, died September 12, 1947, aged 73 years.

Dr. Oscar Dodd, Evanston, Illinois, died October 15, 1947, aged 83 years.

Dr. Frank B. Kistner, Portland, Oregon, died September 25, 1947, aged 73 years.

Dr. Lawrence Cornelius Meredith, Elyria, Ohio, died September 29, 1947, aged 55 years.

Dr. Clarence Henry Smith, New York, New York, died October 6, 1947, aged 72 years.

Announcements

United Kingdom Transactions available

The Ophthalmological Society of the United Kingdom holds a considerable stock of certain volumes of the *Transactions* since their first publication. The following years, however, are not available:

1897; 1898; 1899; 1900; 1901; 1902; 1905; 1906; 1907; 1908; 1909; 1911; 1917; 1918; 1919; 1920; 1921; 1922; 1923; 1924; 1926; 1927; 1928; 1929; 1930; 1931; 1932; 1933; 1934; 1935; 1937 (Part I).

The council feels that many libraries, both at home and abroad, may wish to complete their sets and will be glad to present to libraries, medical schools, and hospitals such available volumes as they may desire. No charge will be made other than the cost of postage.

Those interested are asked to communicate with the Bowman Librarian, The Royal Society of Medicine, 1, Wimpole Street, London, W.1.

Prize for research work

An honorarium of $1,000 to promote research work in ophthalmology is offered through the American members of the staff of the International Association for the Prevention of Blindness. The jury will consist of the executive committee together with the president and the officers of the association.

The award will be made in connection with the XVIth Concilium Ophthalmologicum. Papers may be presented by any responsible research worker. The subject is to be "Simple Noninflammatory Glaucoma" and may include anything definitely related to the question. The matter must be new and of such value, in the judgement of the jury, as to merit this recognition. Papers may be written in English or French; they should be heretofore unpublished or published between this date and October 15, 1949. They should be in the hands of the secretary of the International Association for the Prevention of Blindness, 66 Boulevard St. Michel, Paris, through whom they will reach the members of the judicial committee, not later than October 15, 1949. The decision of the jury will be final.

Preliminary announcement of course

The University of California is announcing a series of postgraduate courses for qualified physicians to be given during 1948. The course in ophthalmology will be given September 6th to 10th. Requests for completed programs and details should be addressed to Dr. Stacy R. Mettier, head of postgraduate instruction, Medical Extension, University of California Medical Center, San Francisco 22.

Gill Hospital spring course

From April 5th to 10th, the Gill Memorial Hospital, Roanoke, Virginia, will hold its 21st annual spring graduate course. Among the guests-of-honor who will appear on the program are: Rear Admiral Clifford A. Swanson, surgeon general of the United States Navy; Dr. H. J. Moersch, professor of medicine, Mayo Clinic; Dr. Bayard T. Horton, Mayo Clinic; Prof. Adalbert Fuchs, formerly of Vienna; and Dr. Conrad Berens, New York.

The first three days, Monday, Tuesday, and Wednesday, will be devoted primarily to instruction in otolaryngology. There will, however, be two clinics of interest to ophthalmologists. The first, at 10:45 on Tuesday morning, will be conducted by Dr. Conrad Berens on the subject, "The Relationship of Uveitis to Chronic Sinus Infection"; and the second, conducted by Dr. Bayard T. Horton, will be held at 2:30 Tuesday afternoon on the subject, "Diseases of the Eye, Including Retrobulbar Neuritis: Treatment with Histamine."

On Thursday, Friday, and Saturday, intensive instruction in ophthalmology will be offered. The complete program follows.

Thursday, April 8th

8:00 to 9:00 a.m. Clinic conducted by Dr. John M. McLean, professor of ophthalmology, Cornell University Medical School, New York.
Subject: "Intracapsular Cataract Surgery."

9:00 to 10:00 a.m. Clinic conducted by Dr. A. D. Ruedemann, professor of ophthalmology, Wayne University Medical School, Detroit, Michigan.
Subject: "Enucleation and Substitutes for the Removed Eye."

10:00 to 11:00 a.m. Clinic conducted by Dr. Edwin B. Dunphy, chief of ophthalmology, Massa-

chusetts Eye and Ear Infirmary, Boston, Massachusetts.
Subject: "An Evaluation of Miotics."

11:00 to 12:00 a.m. Clinic conducted by Dr. Trygve Gundersen, assistant professor of ophthalmology, Harvard Medical School, Boston, Massachusetts.
Subject: "Experiences with Ocular Complications of Herpes Zoster."

12:00 to 1:00 p.m. Clinic conducted by Professor Adalbert Fuchs, UNRRA-WHY, Nanking, Shanghai, China.
Subject: "Injuries of the Anterior Part of the Eye."

1:00 to 1:30 p.m. Luncheon at Hotel Patrick Henry.

1:30 to 2:30 p.m. Clinic conducted by Dr. John M. McLean.
Subject: "Detached Retina."

2:30 to 3:30 p.m. Clinic conducted by Dr. A. D. Ruedemann.
Subject: "The Place of Orthoptics in Ophthalmology and the Use of the Orthoptic Technician."

3:30 to 4:30 p.m. Clinic conducted by Dr. Edwin B. Dunphy.
Subject: "Evaluation of Chemotherapy in Ophthalmology."

4:30 to 5:30 p.m. Clinic conducted by Dr. Trygve Gundersen.
Subject: "The Diagnosis and Treatment of Common Diseases of the Cornea."

7:30 to 8:30 p.m. Clinic conducted by Professor Adalbert Fuchs.
Subject: "Endophthalmitis and Panophthalmitis."

Friday, April 9th

8:00 to 8:30 a.m. Surgical Clinic conducted by the Members of the Staff of the Hospital.

8:30 to 9:15 a.m. Clinic conducted by Dr. Donald J. Lyle, professor of ophthalmology, University of Cincinnati Medical School, Cincinnati, Ohio.
Subject: "The Effect of General Vascular Disorders upon the Brain and Eye."

9:15 to 10:00 a.m. Clinic conducted by Professor Adalbert Fuchs.
Subject: "Eye Operations."

10:00 to 11:00 a.m. Clinic conducted by Dr. A. D. Ruedemann.
Subject: "Early Diagnosis and Treatment of Cataract."

11:00 to 12:00 a.m. Clinic conducted by Dr. Alston Callahan, professor of ophthalmology, University of Alabama Medical School, Birmingham, Alabama.
Subject: "Repair of Ectropion."

12:00 to 1:00 p.m. Clinic conducted by Dr. Rudolph Aebli, professor of ophthalmology, New York Post Graduate Hospital and Medical School, New York.
Subject: "Anatomy and Physiology of the Extraocular Muscles. The Differential Diagnosis of the Heterophorias and Heterotropias."

1:00 to 1:30 p.m. Luncheon at Hotel Patrick Henry.

1:30 to 2:30 p.m. Presentation of Patients with Unusual Clinical Interest by the Staff of the Hospital.

2:30 to 3:15 p.m. Clinic conducted by Dr. Donald J. Lyle.
Subject: "The Effect of Increased Intracranial Pressure as it Concerns Ophthalmology."

3:15 to 4:00 p.m. Clinic conducted by Dr. A. D. Ruedemann.
Subject "The Use of the Beta Radiation Therapy in Ophthalmology."

4:00 to 4:45 p.m. Clinic conducted by Dr. Alston Callahan.
Subject: "Traumatic Blepharoptosis, and Reconstruction of Upper Lid."—Illustrated.

4:45 to 5:30 p.m. Clinic conducted by Professor Adalbert Fuchs.
Subject: "Glioma Retinae and Sarcoma Chorioidea."

7:30 to 8:30 p.m. Clinic conducted by Dr. E. G. Gill, Roanoke, Virginia.
Subject: "Ophthalmic Surgery."

8:30 to 9:30 p.m. Clinic conducted by Dr. Rudolph Aebli.
Subject: "The Medical Management of the Phorias."

Saturday, April 10

8:00 to 9:00 a.m. Clinic conducted by Dr. Donald J. Lyle.
Subject: "Hereditary Eye Conditions."

9:00 to 10:00 a.m. Clinic conducted by Dr. Alston Callahan.
Subject: "Fascia Lata Repair of Retrotarsal Atrophy, and Removal of Orbital Tumor by Inferior Route."—Illustrated.

10:00 to 10:45 a.m. Clinic conducted by Professor Adalbert Fuchs.
Subject: "Diagnosis of Glaucoma."

10:45 to 11:15 a.m. Clinic conducted by Dr. Ralph O. Rychener, professor of ophthalmology, University of Tennessee, Memphis, Tennessee.
Subject: "Ocular Allergies."

11:15 to 12:00 a.m. Clinic conducted by Dr. Rudolph Aebli.
Subject: "Principles of Ocular Muscle Surgery."

12:00 to 1:00 p.m. Clinic conducted by Dr. Donald J. Lyle.
Subject: "The Autonomic Nervous System Relative to the Eye."

1:00 to 1:30 p.m. Luncheon at Hotel Patrick Henry.

1:30 to 2:30 p.m. Clinic conducted by Dr. Ralph O. Rychener.
Subject: "Treatment of Dacryocystitis."

2:30 to 3:30 p.m. Clinic conducted by Professor Adalbert Fuchs.
Subject: "Nonperforating Injuries of the Fundus."

3:30 to 4:30 p.m. Clinic conducted by Dr. Rudolph Aebli.
Subject: "Congenital Anomalies."

Miscellaneous

HOLMES MEMORIAL LECTURE

Dr. E. V .L. Brown, Rush clinical professor

emeritus of ophthalmology, University of Illinois College of Medicine, delivered the first presentation under the gift of the Rudolph Wieser Holmes and Maria Baxter Holmes Fund in memorial to Edward Lorenzo Holmes at the Palmer House on Friday evening, January 30th, at a joint meeting of the Institute of Medicine of Chicago, the Chicago Ophthalmological Society, and the Society of Medical History of Chicago. His subject was, "Edward L. Holmes: Pioneer Chicago Eye Doctor."

Glaucoma clinic

Montefiore Hospital, New York, has established a glaucoma clinic in its ophthalmological service. Although cases in all stages of glaucoma that are eligible for clinic care will be accepted, the Hospital is especially interested in early cases.

Societies

Egyptian meeting

The annual meeting of the Ophthalmological Society of Egypt will be held at the Memorial Ophthalmic Laboratory, Giza, Egypt, on Friday and Saturday, March 12th and 13th.

AOS meeting announced

The 84th annual meeting of the American Ophthalmological Society will be held at the Homestead, Hot Springs, Virginia, on May 17th, 18th, and 19th. The members are requested to send the titles and brief abstracts of such papers as they desire to present at the meeting, to Dr. Frank B. Walsh, Johns Hopkins Hospital, Baltimore 5, Maryland, as soon as possible. All titles and abstracts must be forwarded to Dr. Walsh before April 1st to be incorporated in the call for the meeting to be sent out about April 15th.

Brooklyn Society program

On the program of the 102nd regular meeting of the Brooklyn Ophthalmological Society, December 18, 1947, were: Dr. Jesse M. Levitt, "Occlusion of the Cilioretinal Artery of the Left Eye"; Dr. Ludwig von Sallmann and Dr. W. C. Stone, "Clinical Experiences with Di-isopropyl Fluorophosphate in the Treatment of Glaucoma"; Dr. John M. McLean, "Soft Glaucoma."

Philadelphia officers

The Section on Ophthalmology, College of Physicians of Philadelphia, announces a change of officers. Dr. Perce DeLong, 37 South 20th Street, Philadelphia, is chairman; and Dr. M. Luther Kauffman, Medical Arts Building, Jenkintown, Pennsylvania, is clerk. Meetings are held the third Thursday of every month from October through April, at 8:15 p.m., in the College of Physicians Building.

Pennsylvania Academy meeting

The next regularly scheduled meeting of the Pennsylvania Academy of Ophthalmology and Otolaryngology will be held on April 23rd, 24th, and 25th, at the Hotel Penn-Harris, Harrisburg, Pennsylvania.

Utah society changes name

At a recent meeting of the Utah Ophthalmological Society, a new constitution was adopted. In this constitution, the name of the society was changed to the Inter-Mountain Oto-Ophthalmological Society. This was done to recognize the fact that the society was no longer comprised of local men, but included members from outside the state.

The officers of the new society are: Dr. James A. Cleary, 804 Boston Building, Salt Lake City, president; Dr. Earl H. Phillips, 224 Judge Building, Salt Lake City, vice-president; and Dr. Homer E. Smith, 1005 Medical Arts Building, Salt Lake City, secretary-treasurer.

Reading speaker

Dr. Frederick Willson addressed the 73rd meeting of the Reading Eye, Ear, Nose, and Throat Society. His subject was, "Visual Perception Other than Ocular."

Personals

Awarded Pan-American medal

Dr. Harry S. Gradle, for many years a leading ophthalmologist in Chicago, was awarded the first Pan-American Medal of the National Society for the Prevention of Blindness in the United States, at the recent meeting in Havana. The medal honors Dr. Gradle's contributions toward the prevention of blindness and his service to the establishment of friendly relations with Latin-American countries. Dr. Gradle, now retired, is living in California.

New associate

Dr. Samuel V. Abraham of Los Angeles and Beverly Hills, California, announces that Dr. Philip D. Shanedling is now associated with him in the practice of ophthalmology.

Opens offices

Dr. Barbara Spiro, formerly of the Billings Hospital and The University of Chicago Clinics, announces the opening of offices at the Medical and Dental Arts Building, 7449 Cottage Grove Avenue, Chicago 19.

Receives Snyder grant

Dr. K. W. Ascher, Cincinnati, has received a $2,000 grant from the Snyder Ophthalmologic Foundation to further his research on the aqueous veins.

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GIBSON & DOTY
PRECHTEL OPTICAL CO.
PAUL C. RUEHL
SCHLAGER & SCHLAGER
FREDERICK J. TERNHORST
URSIN-SMITH GUILD OPTICIANS
NORMAN E. VANDERCHER
Kenmore
BUFFALO OPTICAL CO.
GIBSON & DOTY
New Rochelle
BATTERSON, INC., JOHN P.
New York City
AITCHISON & CO.
EDWARD J. BOYES
CLAIRMONT & NICHOLS CO.
FRYXELL & HILL
GALL & LEMBKE
HALPERT & FRYXELL, INC.
HARTINGER, EDWARD T.
A. HAUSTETTER, INC.
HOAGLAND, J. S.
LUGENE, INC. (2 Stores)
MARTER & PARSONS
E. B. MEYROWITZ, INC. (6 Stores)
PAGE & SMITH
H. L. PURDY, INC.
SCHOENIG & CO., INC.
A. R. TRAPP, INC.
Brooklyn
HERBERT E. ALDERMAN, INC.
BADGLEY, H. C.
BECHTOLD & CO., INC.
DOUDIET, ERNEST A.
J. B. HOECKER, INC.
E. B. MEYROWITZ, INC.
J. H. PENNY, INC.
NORTON & SCHNEIDER, INC.
A. M. SHUTT
V. R. TEDESCO
Flushing
BERNARD SHOLKOFF
Garden City
J. H. PENNY CO., INC.
Hempstead
C. WALTER SEE
Jamaica, L. I.
HANSEN, JOHN
Niagara Falls
GEORGE OPTICAL CO.
Rockville Center
SCHOENIG & CO., INC.
Staten Island
YERKUIL BROTHERS
Rochester
WILLIAM J. HICKEY
WALDERT OPTICAL CO.
WHELPLEY & PAUL
Rye
A. E. REYNOLDS
Schenectady
DAY, JAMES E.
OWEN OPTICAL COMPANY
Syracuse
CARPENTER & HUGHES
CLOVER-WHITE OPT. CO.
EDWARD HOMMEL & SONS
Troy
WILLIAMS—OPTICIAN
Utica
KRYSTOL OPTICAL CO.
Watertown
ROBERT L. MEADE
White Plains
CLAIRMONT & NICHOLS CO.
JOSEPH E. KELLY
SAMUEL PEYSER
Yonkers
MILLER & MILLER PROFESSIONAL OPTICAL SHOP

NORTH CAROLINA
Fayetteville
McBRYDE'S-OPTICIANS

OHIO
Akron
VORWERK PRESCRIPTION OPTICIANS
Cincinnati
ETTER BROTHERS
KOHLER & CO.
SOUTHERN OPTICAL CO.
TOWER OPTICAL CO.
Cleveland
CHARLES F. BANNERMAN
HARRY BRAY OPTICAL CO.
E. B. BROWN OPTICAL CO.
RICHARD H. ERNER
HABERBRACKER OPTICAL CO.
HENRY J. PORTER
REED & McAULIFFE, INC.
Columbus
PHYSICIANS OPTICAL SERVICE
Lakewood
HABERBRACKER OPTICAL CO.
REED & McAULIFFE, INC.
Toledo
PRESTON SADLER

OREGON
Portland
MOOR, HAL H.

PENNSYLVANIA
Allentown
L. F. GOODIN
Ardmore
WINFIELD DONAT CO.
WALL & OCHS
Bethlehem
PRICE, WILLIAM H.
Bryn Mawr
J. E. LIMEBURNER CO.
Erie
ERIE OPTICAL CO.
HESS BROS.
WILLIAM J. MAGAY CO.
E. K. MEYERS
Homestead
L. E. NEWLAND II, OPTICIAN
Jenkintown
WINFIELD DONAT CO.
J. E. LIMEBURNER CO.
Norristown
J. E. LIMEBURNER CO.
K. E. PALMER
Philadelphia
BENDER & OFF
BONSCHUR & HOLMES, INC. (2 Stores)
A. W. BRAEUNINGER, INC.
JOHN W. CLEARY
WINFIELD DONAT CO. (2 Stores)
DOYLE & BOWERS
JOSEPH C. FERGUSON JR., INC.
J. E. LIMEBURNER CO. (2 Stores)
RALPH H. MACMURTRIE
MAWSON & KIENLE
FRANK A. MORRISON
MULLEN & WOLF
MULLER & FENTON
WILLIAM J. SCOTT, INC.
WILLIAM S. REILLY
THE WM. F. REIMOLO CO.
SIGISMUND STREET, LINDER & PROPERT
WALL & OCHS (3 Stores)
WELSH & DAVIS
WILLIAMS, BROWN & EARLE, INC.
JOSEPH ZENTMAYER
Pittsburgh
DAVIDSON & CO.
DUNN-SCOTT CO.
B. K. ELLIOTT CO.
GEO. W. HASS, INC.
F. J. MALONEY
OSCAR P. MATOUS, OPTICIAN
CHARLES F. O'HANLON
SHALER & CRAWFORD, INC.
GEO. B. REED & CO.
HOMER J. SABISH, OPTICIAN
Upper Darby
J. E. LIMEBURNER CO.
West Chester
WINFIELD DONAT CO.
Wilkinsburg
DAVIDSON & CO.

TEXAS
Houston
BARBOUR'S PROFESSIONAL OPTICIANS

VIRGINIA
Lynchburg
BUCKINGHAM & FLIPPIN
A. G. JEFFERSON
Newport News
WHITE OPTICAL CO.
Norfolk
E. E. BURHANS OPTICAL CO.
SMITH & JOHNSON OPTICAL CO., INC.
Portsmouth
JOHNSON OPTICAL CO.

WASHINGTON
Bremerton
WESTERN OPTICAL CO.
Seattle
CHARLES R. OLMSTEAD
WESTERN OPTICAL DISPENSARY
Yakima
PHYSICIANS OPTICAL CO.

WEST VIRGINIA
Charlestown
S. A. AGNEW
Parkersburg
RAWLINGS OPTICIANS, INC.
Wheeling
RAWLINGS OPTICIANS, INC.

CANADA
Hamilton
W. E. DAVIES
Montreal
R. N. TAYLOR & CO., LTD.
Ottawa, Ontario
O. L. DEROUIN
GEO. H. NELMS
SUTHERLAND & PARKINS
Toronto
FRED SHORNEY, LTD.
J. C. WILLIAMS
Winnipeg
RAMSAY, ROBERT S.